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Agriculture

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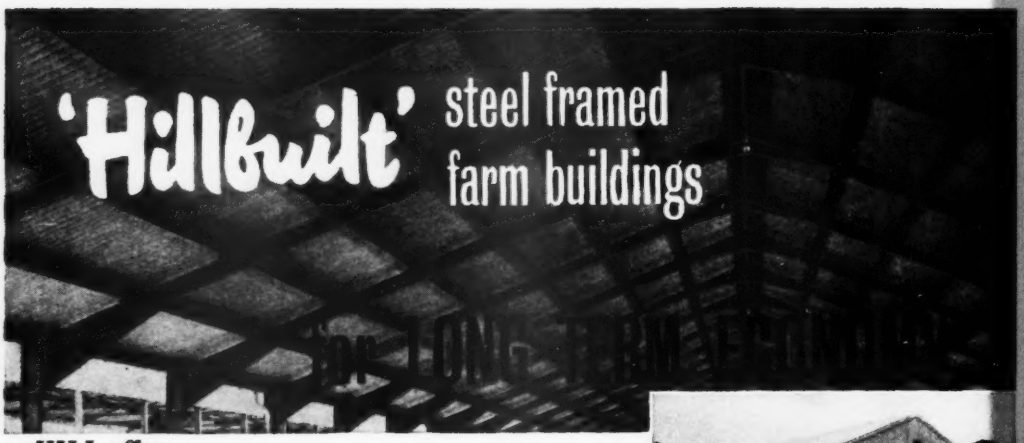

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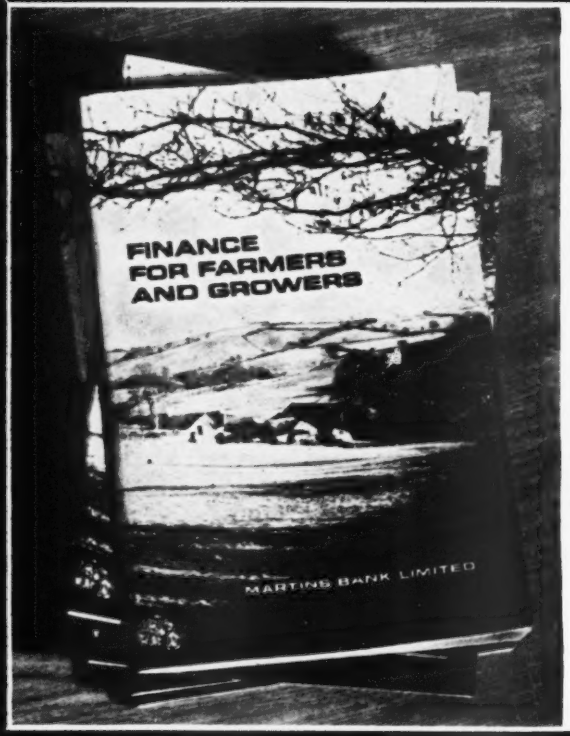

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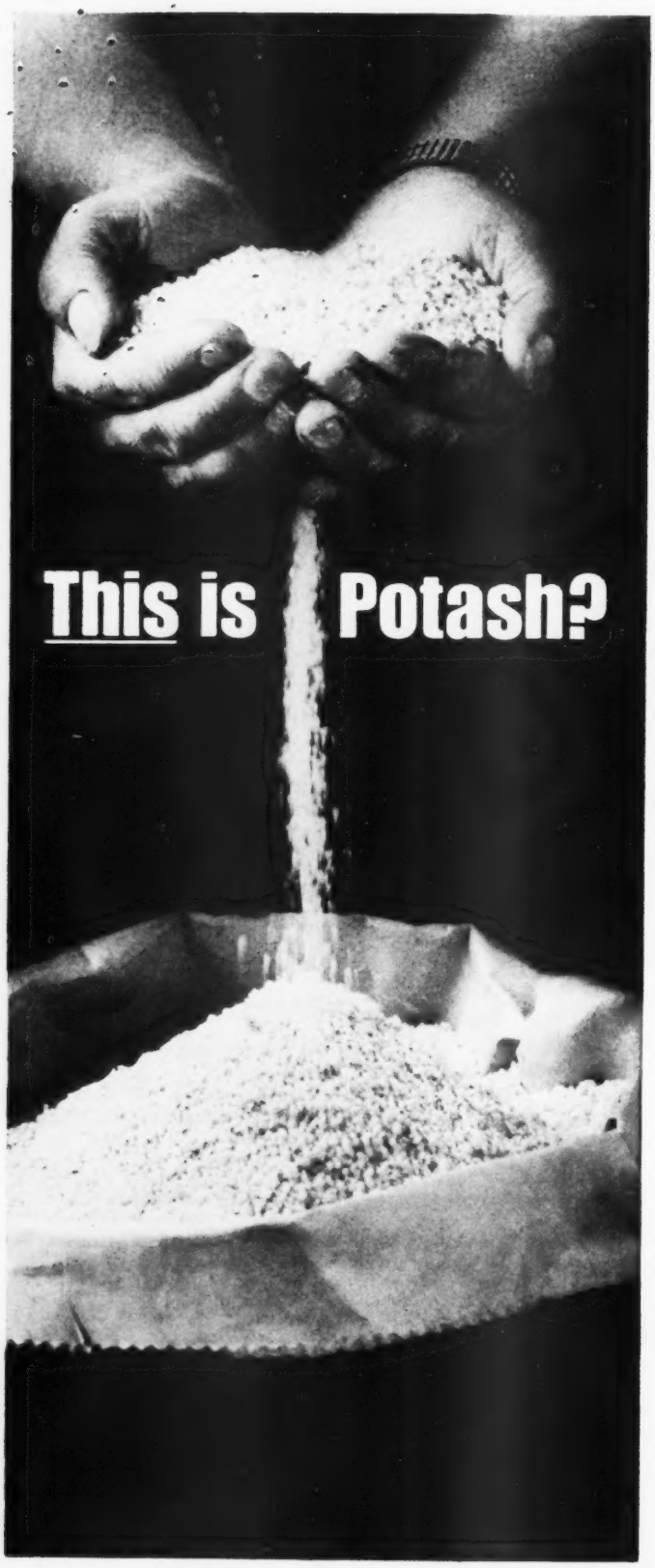

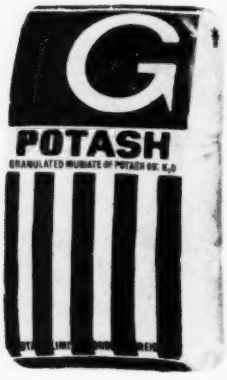

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THE EDITOR

THE Editorship of a Departmental Journal such as this is normally treated as a matter for decent official anonymity. For the past twenty years our editor has in fact been Mr. S. R. O'Hanlon, M.B.E., who last month retired from the Ministry's service. During his long period of occupation of the editorial chair—which we imagine has few equals in contemporary journalism—Mr. O'Hanlon had a large share of the responsibility for the many improvements effected in the appearance and make-up of *Agriculture*, and for the reduction of the space devoted to the more routine official announcements, adequately publicized elsewhere, so as to enable this Journal to give full cover to the ever-growing volume of important developments in agricultural science and practice.

We are sure that our readers will wish to join with Mr. O'Hanlon's many friends in the Ministry in wishing him many happy years of retirement. Mr. Michael Blackman succeeds him as Editor of *Agriculture*.

Sheep Experiment at the Shropshire Farm Institute to achieve greater output per acre

Which System?

Which Breed?

A. G. Harris

THE farms of the Shropshire Farm Institute at Walford extend to some 620 acres and carry a range of livestock and arable enterprises. The adoption of the gross margin system of farm business analysis in 1961 confirmed that the gross margin per acre from the sheep enterprise was lower than that from the arable crops and from the dairy herd, a common finding on many mixed lowland farms. This immediately posed the question: how could the gross margin per acre from the sheep be improved? The costs of the sheep enterprise were already low and therefore little could be achieved by attention to these. The required improvement had to come in the form of increased output per acre. In this respect two lines have been pursued. The immediate remedy appeared to be to increase the stocking density and secondly, over a longer period, to compare the profitability of different breeds and crosses of ewe under these conditions.

Stocking density

To avoid the complication of equating cattle and sheep on a livestock unit basis, the grass and root area used by the sheep has been kept separate from that used by the cattle. Forward rotational creep grazing was adopted, and after four years' experience of this system the total grazing area is now based on a stocking rate of ten ewes and their lambs per acre. This has proved to be the right level in this area, with its average April to September rainfall of twelve inches and a flock mostly lambing in January and early February.

The grazing area is divided into six paddocks to give approximately a twenty-one-day grazing cycle, all paddocks being dressed with 3 cwt of a high-nitrogen compound before the grazing season and with 30–40 units of nitrogen per acre immediately after each grazing for the first two cycles. No trough

food was given to the lambs in the forward creep paddock in the first season, and it became evident that whilst lambs grew well on this system they failed to 'finish' quickly enough. To keep the acreage required to a minimum and to obtain the financial reward of early lambing, it is important to sell lambs of an adequate weight as quickly as possible, and therefore in subsequent seasons trough food has been offered to the lambs in the forward creep paddocks.

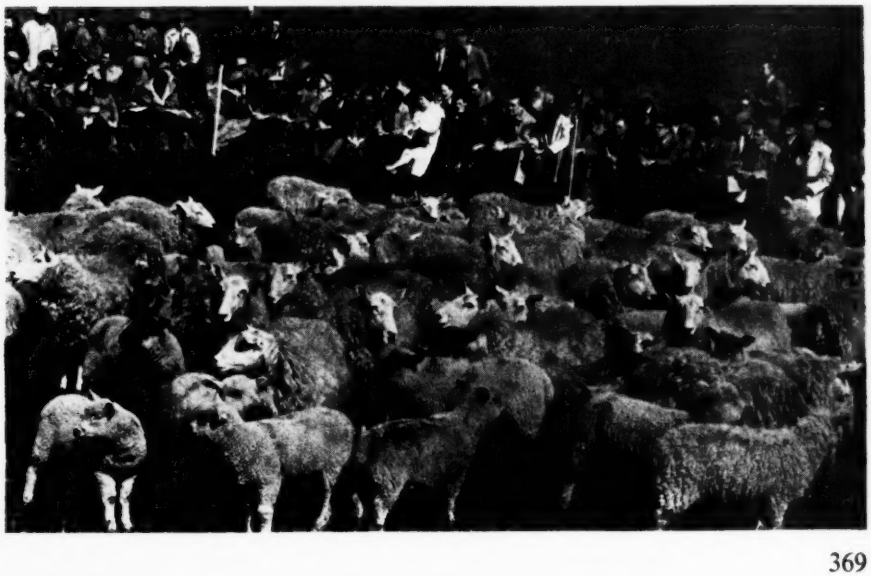
In addition to this area of paddocks, ten ewes require an additional half an acre of grass to provide hay for winter keep and aftermath growth for flushing. Just under $\frac{1}{4}$ acre of 'roots' are also grown per ten ewes for winter feed. This gives a total land requirement of $1\frac{3}{4}$ acres for ten ewes or alternatively a stocking density of 5·7 ewes per acre. This change in policy has had the effect of raising the gross margin per acre to £33 and bringing the sheep within striking distance of the gross margin from land devoted to cereals and the dairy herd.

Breed comparison

This reappraisal of the sheep enterprise coincided with a move by the National Sheep Breeders' Association to assess in realistic terms the merits of different breeds and crosses for fat lamb production under given circumstances. This arose because there was a lack of data from valid and objective breed comparisons under commercial and closely-controlled management systems, despite the fact that 'which breed of sheep' to keep is a fundamental question facing all sheep farmers. To provide the type of information to help a sheep farmer answer this question, a trial flock was established at Walford in late August, 1962.

This flock consisted of forty each of the following breeds of ewe—Clun Forest, Masham, Scotch Halfbred, Welsh Halfbred. These were divided into four groups of forty containing ten of each breed and crossed four ways with Hampshire, Shropshire, Suffolk and Ryeland rams. The identity of each

Welsh Halfbred ewes, with their lambs, on show on a Field Day held at Walford after the first three years of the sheep crossing experiments



group of ewes has remained constant at each mating (except for losses), but the breed of ram has been changed: that is, over a trial period of four years each lot of ewes will have been put to each breed of ram. The ewes started the trial at a common age as two-year-olds. Each of the breeds of ewe and ram were selected by the respective breed societies as being specimens typical of the breed, and were purchased at prices representative of the breed. It was agreed at the outset that no replacements should be bought for ewes which were lost and careful attention has been given to shepherding to ensure a fair comparison of the health of the individual breeds.

The flock has been kept under close observation and detailed records have been maintained on the behaviour and performance of the breeds since they arrived on the farm. Apart from the time when the rams have been with the groups of ewes, the ewes have been run together to ensure common management. The calendar of events to date reads:

Lambing Season	*1962–63*	*1963–64*	*1964–65*
Start of flushing	1st Sept.	25th July	29th July
Introduction of rams	17th Sept.	16th Aug.	14th Aug.
Start of lambing	12th Feb.	14th Jan.	8th Jan.
Forward creep grazing	26th April	23rd April	9th April
Weaning of lambs	27th June	3rd July	

Breed differences have not been apparent in all the features recorded. This was to be expected, but interesting trends are developing. Whilst there is obviously a close link between physical performance and financial return, it might prove useful to review each separately to allow easier interpretation for differing management systems.

Physical results

Three Years Lambing Results and Two Years of Sales

	Clun	Masham	Scotch Halfbred	Welsh Halfbred
Ewe losses to date	7	10	6	3
Lambing % per ewe lambing (3 year)	164–154–153	183–148–179	189–152–181	182–166–181
No. of barren ewes (3 year)	1–1–1	2–2–1	5–4–3	2–2–0
Lambing % per ewe to the ram (3 year)	160–150–140	165–128–168	165–135–153	172–157–176
Total no. of lambs born alive (3 seasons)	170	164	178	199
% lambs sold fat off the ewe (2 year)	38–62	11–66	29–80	14–58
Average % lamb carcasses premium grade (2 year)	81	70	77	72
Average fleece weight (lb)	5·71	6·68	7·4	6·05

Considerable differences in liveability have arisen between the four breeds. Certain losses were to be expected within each group due to lambing or post-lambing problems, but there has been a variation in incidence of these between the breeds. Even more significant are the seven cases of suspected Scrapie which have occurred, two in the Scotch Halfbreds and five in the Mashams. In this latter case the disease occurred in each of the crosses forming the Masham group—Swaledale, Dalesbred and Rough Fell.

Certain features of the lambing results require explanation. The drop in the lamb crop in all breeds in the second year was due to bringing the lambing date forward, a factor which recovered in the third year when the ewes became used to the earlier date. It is realized that the lambing percentage per ewe lambing is not always a good economic measure, but some breeds suffered ewe losses between going to the ram and lambing, and therefore this measure does give a guide to potential prolificacy.

The lambs of all four ram crosses with the Clun ewes are evident in this photograph, taken in April of this year

There were no lambing problems with any of the breeds, although two Scotch Halfbred ewes were lost with severe prolapse. The only consistent shepherding feature has been the sharpness of the lambs at birth from the Welsh Halfbred ewes. One of the most important factors is the number of lambs born alive in the three seasons: this indicates the potential for making money, whether the lambs are fattened off the ewes, sold as stores, or fattened as hoggs on roots.

The proportion of the lamb crop sold fat off the ewe in the first year was influenced by the rate at which the different breeds went to the ram. The Welsh Halfbreds, and in particular the Mashams, come from a very different environment from that found at Walford and were slow to settle and take to the ram in the first season. By contrast, the Clun took readily to the ram. These differences were not as noticeable in the second season, and therefore these results may be more indicative of breed performance. All carcasses, whether sold fat off the ewe or at a later date, qualified for certification, but extra attention was paid to grading to assess carcasses which would be suitable for premium payment if such a market were available.

Financial results

	Clun	Masham	Scotch Halfbred	Welsh Halfbred
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Cost per ewe (without transport)	11 0 0	11 15 0	15 0 0	12 0 0
Average return per fleece (2 year)	1 8 5	1 5 4	1 12 2	1 5 6
Average return per ewe to the ram (2 year)	11 4 8	10 18 9	11 5 3	11 19 1
Gross return from group of ewes (2 year)	876 2 0	831 5 3	901 3 0	956 11 5
Annual Return as % of Cost of Ewe	102	93	75	100

Different interpretations can be placed on these financial results. The return on capital invested is obviously influenced by the ewe but the full effect of the relationship between the return and cost per ewe will not be known until such time as all the ewes have been sold and their barren values realized. Another equally important feature is the return per acre from the

different breeds. In this trial the breeds have been run as one group, and it has not been possible to compare the relative concentrations at which the breeds could be stocked. It is reasonable to assume that the lighter breeds could be stocked more densely than the heavier breeds. The average bodyweights of ewes in this trial are:

	lb		lb
Clun	160	Scotch Halfbred	174
Masham	157	Welsh Halfbred	145

So instead of taking the return per ewe as a direct indicator of the return per acre, it might be more correct to modify the return per ewe in keeping with bodyweights. The combination of return on capital and density of stocking makes a strong case for the smaller ewe, provided she is crossed with the right ram to produce a lamb which will kill out at 35–40 lb. This observation is being borne out in a further trial flock started a year later and consisting of Kerry Hill, North Country Cheviot and Welsh Mountain ewes.

Ram comparisons

The rams used in this trial have been changed each year to reduce the effect which an individual ram might have had. Taking all the lambs from a breed of ram (spread over the four ewe breeds), the results from two lamb crops are:

	% of Crop Sold Fat off the Ewe	Daily Liveweight Gain (lb) of Lambs Sold		% of Lamb Crop Premium Carcasses
		Off the Ewe	After Weaning	
Hampshire	50	0·75	0·38	89
Ryeland	39	0·705	0·375	93
Shropshire	37	0·710	0·40	63
Suffolk	54	0·755	0·39	76

This indicates the superiority of the Suffolk and the Hampshire for fat lamb production, their faster liveweight gain giving either earlier lambs or alternatively heavier lambs if sold at the same time as those from the other two breeds of ram. This general pattern was also true when relating the four ram breeds to the individual breeds of ewe—except for two notable exceptions. These were the Shropshire × Clun, where a high proportion of the lambs were sold early, and the Hampshire × Masham, with only a few lambs being sold early.

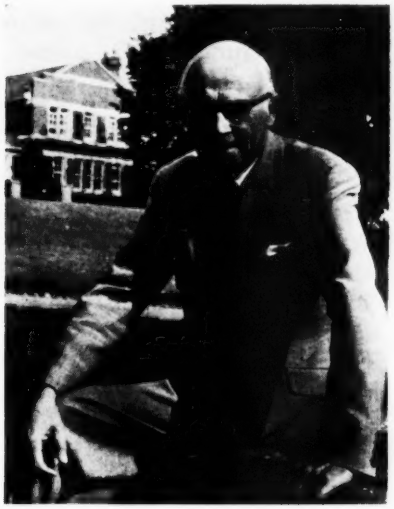
Of the lambs retained for feeding on roots, the Shropshire cross proved superior. The Ryeland ram produced the greatest number of premium carcasses with each breed of ewe, closely followed by the Hampshire.

These results are only of an interim nature, but they are indicating the direction we should follow in our sheep policy. There is a need for an extension of this type of comparison under a wide range of conditions and for a detailed study of the inter-relationship of stocking density and output from large and small ewes respectively, for fat lamb production.

In the conduct of this trial, the author would like to acknowledge the help and collaboration of representatives of the National Sheep Breeders' Association and members of the staff of the Shropshire Farm Institute, particularly Mr. R. W. Griffiths, who has kept the detailed records.

The author, **A. G. Harris, N.D.A., C.D.A.(Hons.)**, has been Vice-Principal of the Shropshire Farm Institute since 1958 and has been responsible for the Institute's farming enterprises. The son of a Devon farmer, he was previously Lecturer in Crop Husbandry at Harper Adams Agricultural College.

The author in the grounds of Seale-Hayne College



Quest for Quality

Whether fodder or cash crops, there is no need to get high yields at the expense of quality, says

Ian Moore

We live in an age largely dominated by economics. Understandably, in consequence, our thoughts and plans centre around production. Production per acre, mouths per acre, gallons of milk per acre—all maximized and success in management is measured by *gross margins*. But what of quality? Thirty years ago, the need to secure high quality often meant the difference between finding a market for one's product or peddling fodder, grain or roots from buyer to buyer, far too often only to accept a sacrificial price in the end.

This state of affairs is not confined to agriculture by any means, as we all know. But in this age of plenty we could do with more thought being given to the question of combining quality with quantity.

How many milk producers this past winter, I wonder, have been bitterly disappointed in the feeding quality of their silage, much of it containing around 15 per cent dry matter instead of the needful 25–30, thus filling their cows with water to the detriment of yield? This is a clear-cut case of the results which must be expected when the importance of the quality of the grass made into silage the previous summer is disregarded. It may also imply complete disregard for the principles of making high quality silage.

What is 'quality'? The Oxford English Dictionary defines it 'degree of excellence (opp. quantity)'. The achievement of the highest 'degree of excellence' gives any farmer a sense of satisfaction which cannot be measured

in terms of cash. Where we, as farmers, disagree with the dictionary is that quality is not necessarily the opposite of quantity. We should strive to secure quality with quantity, and indeed in many instances this can be achieved. The aim should be complete satisfaction—whether human or animal. Haphazard methods and indifference to quality inevitably bring their own frustrations to both.

Fodder and folly

In fodder production, especially, the folly of disregarding quality is likely to have its greatest impact. The success of so many farming enterprises depends upon the *quality* of the fodder. Successful milk and meat production pivot on the quality of the grazing, of the hay, or of the silage, the kale, or the roots. On hundreds of farms the main reason for the need to feed large quantites of concentrates in winter is the low quality of the silage. Hay, still the standby for winter feeding in this country, is often lamentably low in quality, thus involving expensive supplementation, whilst on any journey through the countryside we can see many a staggering indictment of how we squander Nature's greatest gift—the grass crop. Perhaps the reason is to be found in over-concern with low-cost forage, whereas it should always be realized that high *quality* forage is the means to secure good food conversion rates, and low-cost production.

The first prerequisite for successful meat and milk production is an adequate supply of high quality grass for the longest possible grazing season. The expense of winter feeding is then correspondingly minimized. Inevitably there remains a period for winter rations, but this is then very much shorter and can still be successful if quality fodder is obtainable. High dry matter, high protein, these must be the aims in hay, silage and kale. A concentration on silage leads to a minimum need for hay, and haymaking can then receive the attention it merits during the brief spell of suitable weather usually granted to us, and when the grass is at the ideal stage for the harvester. The importance of this is clearly seen from the following table taken from *McConnell's Agricultural Notebook:*

THE EFFECT OF AGE ON QUALITY OF FODDER

	Pasture		Dried Grass		Hay		Silage	
	D.M.	C.P.	D.M.	C.P.	D.M.	C.P.	D.M.	C.P.
Very leafy	18·0	4·0	90·0	18·7				
Leafy	19·0	3·3	90·0	15·0	85·0	13·5	20·0	3·5
Little stem—early flowering	21·0	3·0	90·0	12·1	85·0	10·0	25·0	3·2
Stemmy flowering stage	23·0	2·4	90·0	10·4	85·0	7·6	25·0	2·9
Full flower seed set	25·0	2·1			85·0	4·8		

D. M. — Dry Matter C. P. — Crude Protein

Dried grass gives the clearest picture, in that only water has been driven off. From the very leafy stage of first-class pasture to the stemmy flowering stage at which so many farmers cut for hay, it can be seen that the protein value of the foodstuff is nearly halved.

Kale is of the greatest use in extending an already extended grazing season. It is indeed winter grass but, as with summer grass, the need for quality is paramount. The feeding value of kale depends on its leafiness and

on the amount of stem which is eaten. Variety and time of sowing govern leafiness and succulence of stem. Moreover, kale is rich in protein and carotene; 14 lb will replace $3\frac{1}{2}$ lb hay or $1\frac{3}{4}$ lb crushed cereals.

Cereals too

The need for quality in arable crops may be less apparent—but I suggest it is equally important. The choice of the right variety for soil and climate with skilful adjustment of cultural techniques brings its own rewards. The work of the N.I.A.B. in their variety trials is not used so widely as it should be, and much more attention ought to be given to matching soil, climate, variety and fertilizer treatment. This is shown by the 1964 results in the *Farmers' Weekly* National Grain Competition. The judges found the wheat samples particularly variable, but the champion bread and biscuit wheats came from the same farm. White Victor II winter wheat won the millable biscuit wheat class, and Atle spring wheat won the millable bread wheat class. Yet these varieties yielded 40 and 31 cwt per acre respectively, indicating surely that quality and quantity are not necessarily incompatible.

These are classic varieties, pointing to the desirability of finding a variety to suit specific conditions and marrying this to good cultivations and wise fertilizing.

The champion malting barley for the first three places was Proctor, a good example of quality and quantity factors combined in the one variety, whilst the first two prizes for the best millable oats went to another well-tried variety, Blenda. Like the wheats, the barley and oat varieties were old favourites. It is true there is no premium where quality and quantity is the goal for milling wheat, and any farmer who can store his grain is financially better off if he grows a high-yielding feeding variety of barley rather than concentrating on malting. Why then bother about quality, you may ask? Because of its intrinsic worth. Moreover, if the aim is quality, indirect benefits result so far as securing an excellent sample of grain for seed.

Winning a reputation

So too with potatoes, it is not easy to put a price on quality. Much depends on the individual sample, the buyer and the reputation of the product. Most potatoes, if sound, clean and undamaged, will sell at a premium if suitably graded. The Americans are far ahead of us in this respect. No amount of grading or washing and packing can make a poor quality or damaged potato into a good one, and here, as with many other crops, far too much effort goes into trying to rectify avoidable mistakes.

The quest for quality in crop production presents a real but rewarding challenge to all. Quality may be elusive, but is not the reputation for quality production which a farmer may win, a prize to be valued for its own sake?

H. Ian Moore, C.B.E., M.Sc., Ph.D., N.D.A., Dip. Agric.(Cantab.), Principal of Seale-Hayne Agricultural College, Newton Abbot, Devon, was educated at the Universities of Leeds and Cambridge and was Senior Lecturer in Agriculture and Honorary Reader in Crop Husbandry at Leeds University from 1930-1948. Widely known in the agricultural world, he was a Governor of the Plant Breeding Institute, Cambridge, 1954–1962, a member of the Grassland Utilization Committee, 1957–58, and served on the Advisory Committee on Education in 1964. Dr. Moore was also President of the British Grassland Society, 1953–54, President of the Agricultural Education Association, 1963–64, and has been a Governor of the Grassland Research Institute since 1960.

David Juckes

Pigs and the Size of Farm

WHEN thinking about the size of a pig enterprise there are two variations to be kept in mind—the farm itself and the pig unit. The two are not necessarily connected. True, the largest pig herds are usually found on large farms, but there are a number of very large herds on specialist pig farms which have only a few acres of land. A small herd may equally be found on a large or a small farm, though more often on the latter for reasons discussed later.

First it must be said that although the size of farms on which pigs are being kept is not changing particularly, the size of *herd* is increasing. Consider the changes shown below.

	1957	1958	1960	1961	1962
Percentage of all holdings which keep pigs	38·5	38·0	31·5	31·9	31·8
Average size of *sow herd*	6·0	6·4	6·9	7·4	8·2
Percentage of *sow herds* that are under 20 sows	94·9	94·2	93·2	92·3	91·0
Percentage of *sows* which are kept in herds of 20 sows or more	31·7	34·0	39·1	41·6	44·7
Percentage of *sows* which are kept in herds of 50 sows or more	10·6	12·4	16·4	17·7	19·2

N.B.—1959 is unfortunately not available. Sources M.A.F.F. June Returns E.& W.

Farmers will not need reminding that in 1958 pig numbers fell sharply as the price was reduced. They have since recovered—possibly at a lower rate more recently. The interesting thing about these changes is that the number of large herds, 50 or more sows, increased throughout the period, including the point at which pig numbers fell sharply; this, presumably, because pigs had become less profitable. The number of medium-sized herds moved in concert with the pig cycles, but the number of the smallest herds (under 5 sows) fell even in the two periods before and after the slump when pig numbers as a whole were rising.

Farms where pigs are kept

Leaving for a moment the question of size of herd, the size and type of farm on which pigs are kept may be considered. The following table, relating to 1962, taken from the same source as above, shows how important pigs are on the smaller farms.

Farm Size	Total Acreage Crops and Grass	Pigs/100 acres	Sows/100 acres
0–4	185,094	189·80	22·91
5–19	758,870	84·52	11·28
20–49	1,954,666	35·62	5·02
50–99	4,025,316	19·60	2·79
100–149	3,505,631	15·88	2·18
150–299	6,690,251	14·91	1·99
300–499	3,671,093	13·80	1·69
500–999	2,561,447	14·76	1·86
1,000 +	1,060,925	10·44	1·45

This is not to say that pigs on small farms are particularly important to the national pig production, though in the same year about 20 per cent of both sows and pigs in the country were kept on farms of under 20 acres.

Pigs are kept all over the country; they are uncommon only on the moorlands and mountains. Even so, there are areas and types of farming in which pigs are more important than in others. It seems that pig keeping is associated with barley growing, dairy farming and small farms.

Food is by far the greatest single cost item in pig production and therefore, as in barley-growing areas, grain grown and fed on the same farm is an overwhelming advantage.

It is not so obvious, however, why pig keeping should be associated with dairy farming. The ready answer is the use made of dairy by-products such as skim and whey, but this has been shown to be insignificant. The reason seems to lie in labour costs. Pigs do not usually have a high seasonal demand for labour, as with sheep at lambing time or corn at sowing and harvest. Rather they have daily peaks; they have to be fed regularly. The same is true of cows and milking. Therefore it is possible to fit pig keeping in between milkings.

On small farms the importance of pigs is also probably due to the cheapness of labour, simply because the farmer and his family look after them. On the large farms it is easier to avoid having 'half a man' left over. Also, large farmers who are paying a high rate of tax may prefer to take their income in intangible, and thus untaxed, benefits, such as having a tidy farm.

Food costs

It remains to account for the fact that the smallest herds are going out of business while the number of large herds is increasing. Variation in profitability could arise in three main ways: the inputs into pig production could vary in cost; they could be used more or less efficiently, and the output (pigs) could vary in price.

The principal input is food and any variation in price of food will swamp most other variations. If, as suggested, grinding grain grown on the same farm is the cheapest way of providing the fattening ration at least, some

form of mill is necessary to obtain the cheapest rations. But now that small automatic mill-and-mix units are available, such home-ground and mixed food is available to quite moderate-sized herds of, perhaps, forty sows. It is difficult to see how larger herds can get food any cheaper. When the herd size falls below that at which it is easy to grind food, ready ground food must be bought. The extent to which this will increase the cost of food is debatable, but unless there is some cheap source of food available, it seems likely that in the case of really small-scale pig keeping food prices will be higher. Handling costs on such small quantities of food are bound to be higher.

Labour costs

Labour costs are also important. In general, they fall as the size of an enterprise increases. When Adam Smith showed how division of labour in pin-making greatly increased the productivity of labour he pointed out that the effect was not so marked in agriculture. *The spinner is almost always a distinct person from the weaver; but the ploughman, the harrower, the sower of the seed and the reaper of the corn are often the same.*

But pig keeping is much more like factory work than many types of agriculture and much of the work is repetitious and not affected by the seasons. One of the reasons for increased productivity given by Adam Smith is 'the saving of time which is commonly lost in passing from one species of work to another', and on the whole the lowest labour costs are found where one or more pigmen are employed full time. Where there is more than one pigman it is clearly easier to arrange for time off and illnesses. The number of pigs looked after by one man varies, but forty to fifty sows and their progeny to bacon weight seems fairly normal under conventional systems. Occasionally more are kept per man, and where this can be done without loss of efficiency it will increase profitability. At the other end of the scale labour costs are on the whole what the farmer cares to make them. It is the opportunity cost of the labour used—what else the man might be doing instead of looking after pigs.

It is very difficult to say how capital costs are affected by size of pig herd. Very small specialist pig houses would be more expensive than larger ones, but small herds will rarely be housed in the same way as large ones. It is more a question of whether the size of herd justifies a cost-saving device such as a mill-and-mix unit or automatic mucking-out, and the effect this will have on operating costs.

There is no convincing evidence that efficiency in food use, breeding performance, grading results and the like are in any way related to size of herd. Poor results seen in a few small herds are often due to the fact that with a small number of litters one catastrophe can upset the overall average; in a big herd it is lost among the greater number of successful litters.

Disease could clearly be affected by size of herd. It is possible that large herds are more liable to start an epidemic than small ones. Certainly one hears in the agricultural press about disease outbreaks in large herds quite often, but they are of course more newsworthy. The smallest herds that have to bring in breeding stock often, or, perhaps even worse, that have to go outside for a boar, may be even more at risk.

There is little indication that large pig enterprises can negotiate higher prices for the pigs which they sell. In so far as bacon factories are prepared

to pay a bonus for level delivery, they pay also to groups of farmers who together can guarantee level delivery.

Reason for large herds

While it is clear that some but not all small herds are at a disadvantage particularly with regard to food costs, there is no indication that economies continue after a reasonable size—perhaps 40–50 sows and their progeny. How then can the increasing number of very large herds be explained? There is no reason to suppose that profit per unit of output must be increasing for it to be worth increasing the size of enterprise. In fact, looked at from the point of view of the individual farmer, his profit will be at a maximum when the last unit of output equals in value the cost of producing that unit. Of course the term 'cost' in this context includes the other possible uses to which limited resources may be put. The fact that large herds appear to be as efficient as small herds offers quite sufficient explanation for increasing numbers of large herds, and this process is likely to continue. The limitation of disease risk will in all probability disappear progressively. On the other hand, the only costs greater in the moderate-sized herds will be management, though clearly this need not happen, since the pig herd can be managed as part of a larger farming enterprise, and what Kaldor called 'co-ordination', roughly decision-making. With many alternative opportunities for the efficient manager and co-ordinator, there will be a tendency for him either to have a large pig herd or to do something else. But there is no reason to suppose that the moderate-sized herd will be forced out of business as some have suggested.

It is suggested above that it is fairly easy to see why small pig enterprises have been going out of business. The most likely reason is high food costs. But in one form of pig keeping this is not so overwhelmingly important. In the breeding part of the herd both labour and capital cost of equipment are relatively more important. The small breeding herd selling weaners may well offer savings in both. Labour costs may be low because keeping a few breeding sows may fit in very well with other work. Sows may be kept in existing buildings or outside. In the latter case land rents may be much lower than in places where the food supply is cheap because it is a grain-producing area. Large-sized herds are sometimes kept running out, as they fit well into a particular farming system. Very healthy pigs for fattening are produced under such systems which at the same time would not lend themselves to pig fattening. In spite of these possible advantages, there seems no reason for artificially preventing the build-up of enterprises with all stages of production and low disease risk. In so far as a separation of the stages of production is profitable, it will no doubt continue and any artificial inducements would lead to misuse of resources.

Vertical integration

Finally a word about vertical integration. In general, the two forms this might take are with the feed-supplying firm or with the meat-processing firm, be this bacon or pork, and more or less integrated with wholesaling or retailing of meat. Feedingstuffs manufacturers might try to secure an outlet for their products, but there is no reason to suppose that they could undercut the farmer using his own grain. The meat processor might try to secure his supplies against short periods of scarcity and high prices.

To do this he would have to produce pigs on a very large scale indeed and to have proper control he would have to grow their food supply. In short, the farmer who grows his own grain and carries out all stages of pig production is probably representing as long, or high, a sequence of vertical integration as is likely to occur. In the U.S.A. it is felt that vertical integration in pig keeping might begin to assume considerable proportions if hog keeping and corn growing were spatially separated, but in this country distances are small and it will probably always be better to move the pig or meat.

Small-scale pig keeping, as other forms of small-scale farming, will continue to decline as people require more for their labours than small enterprises can offer, but there is little likelihood of the moderate-sized, efficient unit being forced out by the giants.

> We have been asked to say that the views expressed in this article are those of the author and not of the Organisation for which he now works.

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Safe Sheep Dips for 1966

Farmers are reminded that they should not use dieldrin-based sheep dips after the end of this year, and are warned that none should be stockpiled for use in 1966. New dips to replace the dieldrin varieties have been developed and are now on sale.

The Government's decision to curtail the use of persistent organochlorine pesticides so as to reduce environmental contamination was announced in Parliament on 24th March, 1964. Early withdrawal of sheep dips containing such compounds would have caused difficulties because of the non-availability of replacements. It was agreed, therefore, that they should remain in use until the end of 1965.

★ **The production potential of permanent grass is widely ignored. There is no justification for this**

Acres of Neglect

C. H. MUDD

THERE is more land under permanent grass in Britain than all the tillage crops put together. In terms of acres, therefore, grass is by far the most important crop in this country but unfortunately in terms of productivity it has the lowest output. And yet its potential is the highest of all our crops, for it is not difficult to obtain an output of 4 tons of starch equivalent from an acre of permanent grass (the best crops of barley produce 2 tons of starch equivalent). Why is it that our most valuable crop is the most neglected?

Cause and effect confused

Because the average permanent pasture produces so little grass, it has become traditional to decry its possibilities. We have tended to confuse cause and effect. A productive field is invariably a fertile field; and because perennial ryegrass and wild white clover are the predominant perennial plants on a highly fertile soil, we have assumed that perennial ryegrass and wild white clover are, *per se*, highly productive plants. This is not necessarily the case, for under equal conditions of fertility bent and rough-stalked meadow grass, although generally later to start in the spring, have been shown to produce as much dry matter and protein as perennial ryegrass.

These two plants are able to survive under much lower levels of fertility than the perennial ryegrass and in consequence we have come to associate them with low production. Because they generally grow in a poor soil we have assumed that they are poor plants: all they need is generous feeding to

give much higher yields. As soil fertility improves they will be replaced by perennial ryegrass which is more aggressive in a rich soil, for it starts growing earlier than the so-called inferior type. We tend to attribute improved productivity to a change in species instead of the real cause—an improvement in the soil.

Of course, there are some pastures which never will be productive until the plants growing on them have been replaced by others. White bent annual meadow grass, rushes, buttercup, thistle and bracken will never make good animal fodder however much fertility we pump into the land. These must be replaced by ploughing, spraying or—cheapest of all—by topping regularly so that other species are able to compete.

Indigenous and sown varieties compared

At Great House Experimental Farm we started comparing various seeds mixtures in 1952 by measuring the production in terms of dry matter yield and protein content. The land was in poor heart and many of the sown species died out after a few years and were replaced by volunteer weed grasses such as bent and rough-stalked meadow grass. In some cases instead of an anticipated falling off in production there was actually an increase.

In these experiments we measured the output in terms of grass weight and protein content, although this might not necessarily mean that animal output would be the same. Rushes provided a high dry matter yield but obviously not a high output of meat or milk. The productivity of the pasture must be measured through the grazing animal. We therefore chose three fields in which to make a comparison between the indigenous species and a sown seeds mixture.

The first field was a 'moderate' sward containing 40 per cent of so-called 'good grasses'—perennial ryegrass, cocksfoot, clover, etc. The second field was a 'poor' pasture containing only 20 per cent of 'good grasses'. Rough-stalked meadow grass predominated. The third field was classed as 'very poor' and contained 95 per cent of so-called 'weed grasses'—mainly agrostis and fescue. Parts of each field were ploughed and directly reseeded, but the whole field received the same dressings of lime and fertilizers.

Groups of dairy cows were allocated to the reseeded and permanent pastures in such a way as to ensure equal potential yields, and the production from these fields was recorded over a period of four or five years. In the first seeding year the milk produced from the permanent grass in the 'moderate' field exceeded that from the corresponding area of reseeded land, for there was some loss of production on the ploughed area whilst the new seeds were becoming established. On the 'very poor' field, however, the reseeding gave more milk in the first year in spite of the fact that it had been out of commission for six weeks whilst the seeds established. In the first year on the 'poor field' we grazed with sheep only in order to avoid any possibility of poaching. There was no milk to measure but the liveweight gains of the ewes and lambs were recorded, and this was taken into account in the final economic assessment.

In terms of milk

In the first full harvest year after seeding the new ley produced more milk than the old grass in every case, but by the third year production was beginning to level up. The output from the permanent sward continued to rise

whilst the reseeded grass tended to reach a peak and then decline. The milk produced from the old pasture in the 'very poor' field was in the third year, twice the first year's output; in the fourth and fifth year production was very similar to that of the ley.

All the output attributed to supplementary feeding was deducted from the milk yields and the cash received for the remainder totalled for the full period of the trials. From the total receipts for milk produced on the reseeded area we deducted the cost of cultivation and seeds. Since all the other costs were common to both, we were able to assess the relative profitability of the two systems. In every case the long-term answer was the same—it paid better to improve the sward from the top rather than to plough and reseed it. In the case of the 'very poor' field the balance was only just in favour of the permanent grass (£3 per acre) after five years, but on the 'moderate' sward the permanent pasture left an extra £40 per acre over the four years.

This result was not expected and we concluded that the trial was probably influenced by our rather special conditions—high altitude, heavy rainfall and local atmospheric pollution. So the experiment was repeated by N.A.A.S. District Advisory Officers on two commercial farms—one in the Fylde district of Lancashire, a low-lying rich soil with a rainfall of 35 inches, and the other in the Vale of York, again a low-lying relatively fertile soil and a rainfall of under 25 inches.

In terms of milk yields the answer was the same: the cost of cultivation and seeds was not justified by the increased yields in the first two years. Even the earlier grazing from the seeds in the spring of the year was insufficient to balance the loss of grazing experience during the establishment of the new sward. More recently, in Ireland and in Devon, comparisons have been made between bullocks fattening on permanent and temporary swards: these have shown no improvement in liveweight gain on temporary grass, provided the fertility of the old sward was increased at the same time.

Influence of fertilizers

Another possibility which might account for these results was that the fertilizer levels, particularly of nitrogen, were not high enough to realize the full potential of the 'superior grasses' which were sown. A further experiment was laid down to assess the response to nitrogen on permanent and temporary swards. A field was selected in which less than half the species present were considered to be 'desirable' types. Part of this was reseeded and the output recorded under varying levels of nitrogen up to 400 units per acre.

At relatively low rates of nitrogen (80 units), the ley gave the highest production of dry matter. It contained a high proportion of clover which was supplying extra nitrogen, but at the higher level of nitrogen (over 200 units) the yield of permanent grass exceeded that of the ley. Even at rates as high as 800 units of nitrogen, the permanent grass responded better. A count of leaf tillers showed the equivalent of 30 million per acre on the ley and 60 million on the permanent grass. Perhaps the extra leaves made better use of the nitrogen supply.

In practice, it is well known that temporary grass is on the whole more productive than permanent pasture, and as things are this is undoubtedly true. The reasons are not difficult to find—it is largely a question of fertility and management. Surveys to ascertain fertilizer practice show that over the country as a whole leys receive more than twice as much nitrogen and potash

and 60 per cent more phosphate than permanent grass fields. In addition, the leys are obtaining the residual fertility of the arable crops. Because the permanent pastures are not held in high esteem they are misused: livestock are allowed to poach them in wet weather, they are rarely topped and the mole—and ant—hills are left untouched. No wonder they fail to produce the goods.

It's management and manuring that count

A survey carried out in Cheshire by the N.A.A.S. revealed that grassland productivity in that county, measured in terms of utilized starch equivalent, depended almost entirely upon the amount of nitrogen used. The type of sward was relatively unimportant. National surveys have indicated the same thing—it is the management and manuring that determines output and not the particular plant which is growing.

This does not mean that the era of the ley is over. The ley will be required for a long time to come on mixed farms, and it will be required for very early grazing and, as maiden seeds, for its milk-stimulating properties in mid-season. It will also be necessary to reseed land in very poor heart when immediate high production is required on farms where it is impossible to wait two or three years whilst fertility is built up in existing sward. The ability of the ley to produce free nitrogen through vigorous clover root systems is another valuable asset, but whilst half of Britain is covered with permanent grass its potential should not be ignored.

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The Vaynol Estate

THE GAIN

Full-time livelihood

Increased capital value

Economic rents

Modernized farms

HOW 360 SMALL, UNECONOMIC HOLDINGS ARE BEING WELDED INTO AN ECONOMIC ESTATE

Tom Jones • Arthur Jones

AT a time when there are various influences for amalgamation of farms and a contrary view expressed for supporting the small farm as a part-time unit, it may be timely to report on the outcome of a planned concentrated operation by a well-known North Wales estate to improve management and, in particular, to strengthen farm structure.

The Estate

This is the Vaynol Estate in Caernarvonshire, comprising some 22,000 acres of farm land, a number of town and village properties and a large slate quarry. It extends from the Menai Straits in the north to the summit of Snowden, at 3,561 feet, eleven miles away, in the south. There is a gradual transition from the relatively flat, fertile land near the Straits, where the Park and Home Farm, with some 1,000 acres of woodland, are situated, to the mixed land in the foothills and then to the rough, rocky ground on the lower slopes of the main range, which extends to the large area of open mountain.

In the main the farms are livestock-rearing units, with some dairying and limited grain growing on the lower ground of the Estate; the high ground supports large flocks of Welsh Mountain sheep and a number of hill cattle.

The Estate is owned by the Trustees of the Vaynol Settled Estate and is the home of Sir Michael Duff, the life tenant, who succeeded his father as third baronet in 1914. Sir Michael is Lord Lieutenant for the County of Caernarvon.

Looking up to Llanberis Pass, in the heart of Snowdonia

Slate quarrying and farming

Near the centre of the Estate, at the foot of Llanberis Pass, is the Dinorwic Quarry, famous for its good blue-grey durable roofing slates. Some 6,000 men were employed seventy to eighty years ago and, as most of these were from farming stock, there was a great demand for small farms both to supplement income and to satisfy a natural inclination. With a large acreage of common land in the vicinity, the quarry men established their Tai Unos* which according to tradition could be occupied, by inalienable rights, if a rough abode was put up overnight and smoke issued from the chimney before dawn; also a small croft could be enclosed around this abode.

The Estate also formed its own holdings of 3–15 acres and let them on leases of up to 40 years at low rents with supplies of materials for the tenants to build their homesteads. Most of the Tai Unos holders ultimately accepted help from the Estate and their holdings eventually became estate property. A few, however, refused this help, although they lost their employment in the quarry. Their descendants stand out today as proud freeholders surrounded by Estate property. Any quarryman who had a few acres of land, a cow and some sheep was considered to be a privileged member of the community at the turn of the century.

The Estate in the 1950s

The Estate still reflected a smallholding structure in 1957, when it was recorded that there were 350 farms of 5–30 acres and only 50 farms of 100–300 acres. Land and buildings had run to ruin during the war years and both landlords and tenants were apprehensive of the farming and quarrying prospects.

It was evident that the structure of the agricultural estate was not in tune with the times, and when a new agent was appointed in 1956, he immediately

*habitations built overnight.

arranged for a survey to be made of the whole Estate. One of the first results of this survey was the decision to dispose of town and village cottage properties—mainly to the occupiers—and the reservation of the proceeds for agricultural development. It was also proposed to amalgamate a large number of small uneconomic holdings into manageable and long-term economic units.

The farm amalgamation schemes

The amalgamation of holdings looked a formidable undertaking. First the groups of holdings and part holdings which would constitute the new farms had to be planned and then suitable former tenants selected to occupy these new farms. The other tenants were asked to relinquish their land but were given the opportunity of buying their cottages and gardens. In the great majority of cases, the Agent was able to negotiate surrender terms; comparatively few notices to quit had to be served. In the meantime, based on the survey, the Agent submitted applications to the Ministry of Agriculture, Fisheries and Food for Farm Improvement Scheme grants towards the individual costs of amalgamation under Sections 16 and 17 of the Agriculture Act 1957.

The findings of the survey of the Estate were:

Thirty-two farms, already substantial economic holdings, would not be affected by amalgamations.

Nineteen farms were also economic but would have small areas of land added to them.

Over 360 small uneconomic units, embracing some 15,000 acres, could be conveniently assembled into 77 new farm units.

Of the seventy-seven proposals submitted, forty-one complied with the conditions of the Agriculture Act 1957. The others failed to qualify for grant on the grounds that (a) they were trivial in scope, (b) amalgamation was unlikely to take place in a reasonable time, and (c) they constituted non-viable units. This third category accounted for 18 out of 77 proposals and, although not eligible for grant, they were worthwhile projects as they represented the amalgamation of about 102 holdings and 28 part holdings into 18 larger units.

The forty-one proposals which were approved for grant covered 11,353 acres and showed a rent appreciation, without prior charge as improvement of fixed equipment, of 71 per cent of the old rent. The thirty-six rejected covered 4,470 acres, and some 7,000 acres were unaffected by the proposals.

The actual process of amalgamation began with the service of notices to quit in November, 1960, and most of the new lettings had taken effect by November, 1963. Ministry grants provided a one-third contribution towards the reasonable costs of the initial field and farm survey of the agricultural part of the Estate, compensation for disturbance paid to outgoing tenants, costs of agreements, and other incidental expenses.

Types of amalgamations

There is considerable variation in size and quality of the forty-one amalgamations which were approved for grant-aid. The self-contained dairying units range from 45 acres to 150 acres at average rents of £3 per acre, and truly upland sheep farms are from 200 acres to over 1,200 acres at present-day rents of less than £1 per acre overall.

The pattern of small fields and farms on the distant hillside is a typical example of farm structure in this upland area

Here are some typical examples of newly-formed holdings:

Lowland unit: Dairying with livestock rearing

	Acres		
	Total	*Pasture*	*Rough*
Parent holding	84·100	76·400	7·700
2 other holdings	68·117	53·367	14·750
TOTAL	152·217	129·767	22·450

Semi-upland unit: Livestock rearing with some dairying

	Total	*Pasture*	*Rough*
Parent holding	267·333	63·000	204·333
3 other holdings	25·879	15·394	10·485
TOTAL	293·212	78·394	214·818

Lowland unit with detached hill farm: Livestock rearing

	Total	*Pasture*	*Rough*
Parent holding	59·193	33·193	26·000
7 other holdings and 3 part holdings	51·372	31·251	20·121
	110·565	64·444	46·121

	Total	*Enclosed*	*Open Mountain*
Hill farm of 3 holdings	889·154	290·154	599·000

Hill farm: Mainly sheep rearing, with part of the flocks wintered away

	Total	*Pasture*	*Ffridd*	*Open Mountain*
Parent holding	260·410	20·000	50·117	190·293
6 other holdings	791·726	37·327	86·538	667·861
TOTAL	1,052·136	57·327	136·655	858·154

Present position and trends

The consolidation of the scheme is now in progress. New tenancies are created on new form agreements in which responsibilities of both landlord and tenants are re-defined and based on statutory model agreements, and there are indications that management is now under firm control. Full advantage has been taken of Government grants under the Hill Farming and Livestock Rearing Acts and the Farm Improvement Scheme, and good progress is being made on a substantial buildings programme in order to bring the new homesteads up to the necessary standards.

There are twenty approved schemes under the Hill Farming and Livestock Rearing Acts which involve an expenditure of £60,000; a total of around £200,000 in capital schemes is contemplated as a follow-up to the very serious reorganization of farm structure begun in 1957.

In the meantime further amalgamations are taking place as tenancies fall in; five out of the eighteen non-viable units already referred to have been merged in viable holdings and two of the top-heavy hill farms are now being run with lowland farms. This is a very desirable combination where wintering of hill sheep is such a problem.

The change in farm structure between the 'fifties and the 'sixties is:

	1957	1965
Viable farms	50	105
Non-viable farms	350	28

A great deal has been achieved on the Vaynol Estate in turning the liabilities of the 1950s into assets in the 1960s.

Tom Jones, A.R.I.C.S., A.A.I., is a Divisional Land Commissioner and **Arthur Jones, B.Sc., Q.A.L.A.S.,** an Assistant Land Commissioner, in the Ministry's Agricultural Land Service. Both have been associated with land management in its various phases for many years and are at present stationed at Caernarvon.

Research Spot

CEREALS
POTATOES
SUGAR BEET
GRASS

The 1964 Report of the Plant Breeding Institute is available price 5s. 6d. from Maris Lane, Trumpington, Cambridge

Progress in Plant Breeding

A. J. L. Lawrence

A MAJOR requirement in crop breeding is that the new variety should 'breed true', i.e., it will have an acceptable degree of genetic purity. Thus the seed certification schemes, which regulate the growing of crops intended for seed in this country, require certain genetical standards in the mother seed.

But varieties are not always genetically pure. In recent years some have been bred by a technique involving the mixing of a number of distinct genetic lines. They bear a 'mixed' genetical character and are therefore not eligible for certification.

There may be some risk that the high performance of these particular 'mixed' varieties may lead to a general undervaluation of varieties which have high stability and reproducibility, and to the acceptance of reduced standards in plant breeding methods. Such a situation will need to be viewed against the background of the recent acceptance in this country of the principle of Plant Breeders' Rights.

These are some of many interesting points put forward by the Plant Breeding Institute, Cambridge, in its recently published Annual Report for 1963–64. It is particularly encouraging to find in a scientific report so many practical conclusions and comments of direct interest to farmers. These occur throughout the Report but particularly in the general survey of the work of the Institute, in Part III, and in other sections on specific crops.

Cereals

The quality of British wheats is extremely important at the moment and so the Institute is paying particular attention to the growing of grain in good physical condition and to the physico-chemical characters of the grain in relation to processing requirements.

In describing further work with cereal varieties, mention is made of studies of the relationship between grain composition, the sprouting of grain in the ear and weathering of the grain. Extreme weathering, such as may happen in a late harvest, increases the α-amylase content of the grain and reduces the quality of the flour for bread-making. It does not appear that the differences in α-amylase content are necessarily associated with the differences in the tendency of the grain to sprout in the ear.

The winter wheat variety Professeur Marchal, for example, combines a high content of α-amylase with high dormancy. The spring wheat, Opal, which seems likely to replace Jufy I because of its greater yield potential, has not, in tests at the Institute, shown a strong resistance to sprouting, a character for which all new cereal hybrids are being systematically tested. It is clear that many aspects of grain quality, including the capacity to cope with really adverse harvest conditions, need further investigation.

The Institute's hybrid winter oat, Maris Quest (all varieties bred at the Institute have Maris as a prefix) has produced better yields and strength of straw than any other available winter oat. An improvement needed in winter oats is winter hardiness. This is being studied at the Institute in artificial freezing tests. A new source of breeding material likely to confer tolerance towards barley yellow dwarf virus and powdery mildew of oats is now available. If both these diseases can be controlled by breeding suitable oat varieties, the present gap between oats and barley as feed grains might be narrowed and the reduction in oat acreage halted.

It is noted that the two-row spring barley Maris Concord, which combines earliness, high yield, strong straw and resistance to mildew with the promise of malting quality, has given outstandingly good performance in trials in East Anglia. It has no tendency to sprout in the field during wet harvests—a weakness which spoils many potentially good malting samples.

A two-row winter barley, Maris Otter, tested by the N.I.A.B., has good winter hardiness, short, stiff straw, early maturity and good malting quality. In trials during two very hard winters, sufficient to kill autumn-sown Proctor, it yielded well and usually matured several days before Pioneer; it also stood much better. Although Maris Otter is a winter barley, it has a low vernalization requirement and, in contrast with Pioneer, can be sown early in the spring.

Potatoes

In the Potato section of the Report official statistics are quoted showing that of the maincrop varieties used in England and Wales, Majestic constitutes 44 per cent and King Edward 21 per cent. Arran Pilot is the outstanding first early variety and Craig's Royal the predominant second early. Nevertheless, the first three of these leading varieties all have serious faults, and the Report refers to the undoubted need to breed still better varieties to replace them.

Of the new varieties mentioned in the Report, Maris Piper would appear to be an important development because it combines good field characters

with resistance to eelworm. It will be distributed as soon as adequate stock is available.

Interesting side-lights are thrown on the cooking qualities of potatoes. Stem-end blackening after cooking depends on the chlorogenic acid and citric acid content of the tuber. Chlorogenic acid causes blackening, but this may be negligible if the citric acid content is high. The variety Ulster Beacon, for example, always has a low content of chlorogenic acid and never shows stem-end blackening.

Sugar Beet

In spite of low rainfall, the 1964 growing season was exceptional for sugar beet crops, which gave above-average yields (18–19 tons/acre) and high yields of sugar (17–18, even 19 per cent).

The cause of this exceptional performance may lie in the length of the growing season, temperature levels and the incidence of sunshine. These considerations indicate the need for more detailed studies on sugar beet physiology and varietal adaptation, with particular regard to the effects of climatic variation.

The most serious of sugar beet diseases, virus yellows, continues to impose severe losses. The section of the Report dealing specifically with sugar beet draws attention to the advances made in breeding for resistance to this disease and also to other important aspects of sugar beet breeding, such as resistance to bolting, polyploidy, male sterility, monogermness and the problem of juice quality.

Grass

Further impetus to the improvement of herbage quality by plant breeding has been given by the availability of feeding barley producing starch equivalent at a cost comparable with that of grazing. At the Cambridge Institute the assessment of the quality of grass varieties is being investigated by *in vitro* laboratory methods which measure digestibility and soluble carbohydrate content of grass at different life-stages. Variations in the values occur, and if these can be shown to be consistent this may indicate the lines on which varieties and strains of improved nutritional value may be bred.

TEN THOUSAND BACON PIGS A YEAR

●

ONE MAN

Farmer Extraordinary

Wesley Patterson

A MAN of simple tastes, Jimmy Jordan believes in simple farming. He keeps only fattening pigs and fattening bullocks. The bullocks get a simple ration, grass or hay, and the pigs barley meal, soya and whey. He keeps his pigs in simple houses—just concrete walls, roof and floor, with a metal door. And his fertilizer programme is simple too—just pig manure.

He is unperturbed when his ideas are criticized, and accepts that it *sounds* foolish to feed bacon pigs such a simple ration; but he has found that it works, and that is his justification. Told that his houses, which cost less than £5 per pig, should be replaced by more elaborate models, with controlled ventilation and costing at least four times the price, he is similarly unmoved.

Whilst everyone who is 'with it' produces barley beef, Jimmy Jordan turns out two lots of fat cattle (about 1,200 a year) from grass and hay alone. Well-fertilized leys are the order of the day for good grassland management, but on this farm old pasture, fertilized only with pig manure, gives production figures which have to be seen to be believed.

Controlled environment piggeries with thermostatically-controlled ventilation, insulated floor and roof, feeding passages and dunging passages, are not for this farmer; he prefers the old-fashioned loose box, without fans and without insulation in either roof or floor.

Old principles with new ideas

After this introduction, readers may wonder why the Jordan enterprise merits an article in *Agriculture*. The reason is that Jimmy Jordan is a farmer extraordinary—a man who has gone back to nineteenth century principles of housing and feeding and combined them with twentieth century mechanization to give an output that most people would believe impossible—10,000 bacon pigs a year by *one* man.

With his brother and son, he owns a total of 650 acres, on which are produced 1,200 fat cattle and 35,000 pigs a year. About 700 cattle are bought as forward stores in early spring, housed on slatted floors and fed on barn-dried hay until turning out to grass for fattening in May and June, when prices are highest. A second lot of 500 is bought in summer and sold fat off grass in the autumn. The cattle leave a gross margin of over £30 per acre, which is entirely satisfactory for an enterprise that has never been noted for high profits.

But it is for his pig enterprise that Jimmy Jordan is famous. Take his Cherry Valley Farm alone. This farm has only one man, and he looks after 250 bullocks and 3,000 pigs except for one morning a week when a mobile gang from another farm helps him to sort and load the pigs and cattle for market. Far from being overworked, this man has quite a lot of spare time, and it is therefore proposed to increase the number of pigs on this farm to around 5,000.

The pigs are housed in boxes 16 ft × 8 ft of simple design and, as has been said, made of uninsulated concrete floors, walls and roof, with metal doors and two panes of glass. A slatted channel for the slurry runs at the front of the house, and at the back there is a metal feeder 3 ft long by 8 in. wide and 5 in. deep. Food is pumped round twice a day, the pigs feeding themselves by operating the automatic valves. The feeders are so sited and of such a size that ensures they are never fouled.

Comfort paramount

Many people will object that uninsulated concrete floors and walls are very cold, but it should be remembered that once the house has been fully warmed, they lose or gain heat slowly and so, despite fluctuations in outside temperature, preserve an even temperature.

The ventilation in these houses is simple but effective. All the air comes in and goes out at the front, either through the partly-open half door or window, or both. The floor is highest at the back of the house and the roof slopes in the opposite direction. The cold air comes in over the bottom half of the door, mixes gently with the warm air, flows along the floor (so the pigs are getting fresh air continually), rises at the back, flows along the roof and out again at the top of the doorway. One thermostat and a small electric

The pens in this comparatively new range of piggeries are made of concrete, with steel doors. Graded pigs, selected from the fattening houses, being driven off to market

The dry feed is tipped from a lorry into a hopper and transferred by auger to a bulk storage tank. Under this is a mixing tank from which the meal, plus water and whey, is pumped to the pig pens

motor automatically control the opening of the doors in about twenty pens, and so maintain a temperature which never varies more than three to four degrees.

This system of ventilation is one of the secrets of success of the Jordan system. The Veterinary Investigation Service did careful tests in these piggeries and found there were seventeen to twenty complete air changes per hour. The pigs are getting fresh air all the time, but none of the cold draughts which are so disastrous.

Because of this excellent ventilation and the ingenious method of feeding described later, more pigs than usual can be kept per pen. No space is wasted with feeding or dunging passages and numbers are not limited by the length of the feeding trough.

With wet feeding, the pigs take in about three gallons of liquid per day, compared with about one gallon of water drunk by pigs on dry feeding. The large volume of urine produced makes bedding impracticable. However, the high humidity produced by the wet feeding and large volume of liquid means that the pigs are comfortable at higher temperatures than they would be under dry conditions. The high humidity also eliminates dust (which causes irritation to the nose and lungs), and viruses and bacteria are not floating about in the air and infecting other pigs in the pen. For this reason and also because they are always in a warm, equable environment, free from draughts, the health of the pigs is much better than normal, and they are particularly unaffected by the pneumonic troubles which cause so much illness, slow growth and poor food conversion in Danish-type piggeries.

I have described the conditions under which the pigs are kept in some detail because it is the comfort of the pigs, far more than the mechanics of feeding them, that makes the Jordan system so successful. And it is only because of the splendid health of the pigs that such large numbers can be looked after by one man.

Automatic feeding

The mechanical feeding of the pigs, like most things on the farm, is ingenious. The meal, milled and mixed on the farm, and untouched by hand, is brought in a bulk tank and transferred by auger to an overhead storage

bin. From the storage bin it is transferred by a small horizontal auger (on a time switch) to an underground mixing tank. Here the barley, water and whey are agitated by paddles before being pumped round the pipeline to the pens. In each pen is a valve opened by a tongue which the pigs press, allowing the gruel to flow into the small trough.

The whole process is operated by a series of time switches. The required amount of water and whey goes into the tank, and at 6.30 morning and night the auger starts delivering meal from the storage bin. Thereafter, the pumps start up and the pigs help themselves for the next one-and-a-half hours. Rationing, which is very important with purchased pigs being fed solely for the Wiltshire bacon trade, is done simply by varying the proportion of water in the gruel. The pigman does not even have to press the switches, so there is little work and a five-day week is possible.

The pigs get an average of 2 lb barley, 2 gal whey and 1 gal water per day. They are brought to the farm by dealers at around 53 lb live weight, and reach bacon weight in about sixteen weeks.

Wesley Patterson, B.Agric., is Senior District Advisory Officer in the N.A.A.S. and is stationed at Huddersfield. He was previously District Advisory Officer for the Worcester area and is especially interested in research on pigs and in the simplification of farming.

THE FARMER

JIMMY JORDAN is a native of Ulster, and the farms about which this article is written are in Northern Ireland. His main farm is Drumbane House, Moira, Co. Down. The next biggest pig unit is on Cherry Valley Farm, Crumlin, Co. Antrim, and he has a smaller pig unit at Lurgan, Co. Armagh.

Fat Lambs from Rape

R. J. Phillips

HILL farming is far from flexible. Long winters, poor steep land, high rainfall, labour shortage and difficult access all contribute to force the hill farmer into two relatively low profit enterprises—sheep and rearing cattle. A further disadvantage is that his avenues of sale are extremely limited. If he relies on selling his lambs store he is at the mercy of a fairly widely fluctuating market. One of the few ways he has of easing himself at least part way out of the straight-jacket of these conditions is to fatten some, or even all, of his sale lambs. This permits a choice of sale and provides the security of the guaranteed price for fat lamb.

Indoor fattening of lambs leaves small profit margins particularly if bought foods are used and the cost of buildings is included. In addition, hill lambs do badly indoors compared with lambs of lowland breeds. If concentrates will not produce a fat lamb economically from the hill, will a home-grown forage crop?

The present acreage of rape in Wales is 37,000 and it occupies 11·6 per cent of the tillage area. That so much is grown in Wales and so little now in England suggests that it is of particular use to the hill farmer. This is borne out by the statement 'There's nothing like rape for lambs', which is often made by farmers in livestock rearing areas in Wales. No one ever challenges this assertion. But is it well founded?

A costing survey

Rape has proved itself a valuable pioneer crop, and some farmers strongly believe that it is an essential before reseeding on rough ground, regardless of the immediate economics. The old, matted sward is allowed to decompose, the treading effect and the manure of the sheep are beneficial and the ground settles before an expensive seeds mixture is sown. No doubt these points are important, but putting the intangibles aside, an attempt was made to assess the costs and returns of this fodder crop. This was done in Brecon in the summer and autumn of 1964.

The cost side was fairly straightforward, apart from the fact that several assumptions about method had to be made; one was that variable costs only should be taken. Opportunity costs of the grassland forgone as a result of growing rape might have been included, but most land seeded with rape was fairly poor and unproductive and, for that reason, this cost was omitted. The returns were measured by taking the increase in the value of the lambs from the time they started to graze the crop until they were sold fat.

The survey gave a good indication of typical crop practice and costs, but the sample was not large enough to give a reliable measure of returns. However, other survey work was consulted and a representative, up-to-date, cost-return picture for the crop was built up.

Typical Costs and Returns for Fattening Lambs on Rape

Returns per acre	£ *s.* *d.*	£ *s.* *d.*
20 lambs @ a liveweight gain of 1·3 lb per week for 7 weeks (9 lb total l.w.g.) giving a return of 20 × 14*s.*	14 0 0	
	14 0 0	14 0 0
*Variable costs per acre**		
Cultivations (8 hr @ 1*s.* per hr for fuel and oil)	8 0	
Fertilizers (½ ton basic slag @ £5 per ton, 3 cwt straight nitrogen fertilizer @ £15 per ton—less residual value of ¼ ton slag)	3 10 0	
Seed (Giant Rape—8 lb @ 3*s.* per lb)	1 4 0	
	5 2 0	5 2 0
		8 18 0

GROSS MARGIN per acre £8 18*s.*

GROSS MARGIN per lamb 9*s.* approx.

*Here, fuel and oil are considered as variable costs.

Variations

These costs and returns are for a pure rape crop, but it is also common practice to use rape as a cover crop when reseeding. A similar lamb performance can be expected but at a reduced stocking rate of about 8 lambs per acre. A danger is to sow too much rape and so smother the clover of the establishing ley. This practice is therefore risky, and for reseeding an absolute maximum of 1½ lb of rape seed per acre is advisable. If successful, this method produces a cheap forage crop because only a small amount of seed is used and the cultivation costs can be spread over the life of the ley.

Fodder radish has been tried as a substitute for rape, but this crop has one great disadvantage—it tends to run to flower very quickly and produce an unpalatable and fibrous stem. Its only purpose seems to be for a small acreage to tide store lambs over until they move on to rape.

Risks and hidden costs

The margins per acre and per lamb are quite substantial, whether rape is grown alone or as a cover crop—but there are some drawbacks. Pulpy kidney disease is a possibility and vaccination is advisable; also, foot-rot can

be a problem resulting in low liveweight gains. Fencing, if necessary, could put up costs appreciably. Rape is very susceptible to club-root disease, and a bad infection will reduce yield drastically. And, not least, store prices in some years could move in such a way that the best policy would be to sell the lambs store rather than fat. Of course, store prices could move the other way, giving far better gross margins than the typical ones quoted!

All risk and cost factors must be assessed, but on balance, in most years and in most conditions, fattening hill store lambs on rape could be profitable. But timely and adequate cultivations must be carried out and sufficient phosphate and nitrogen fertilizer used.

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The Ministry's Publications

Since the list published in the July, 1965, issue of *Agriculture* (p. 355) the following publications have been issued.

TECHNICAL BULLETINS

No. 7. Plant Nematology (Revised) 35*s.* (by post 36*s.* 4*d.*).
Contains basic material on morphology, biology and systematics, and brief discussion of the economic importance of the groups. Practical aspects are reviewed, with the emphasis on temperate conditions, and there are comprehensive reference lists as well as an appendix.

ADVISORY LEAFLETS

(*Price* 4*d. each—by post* 8*d.*)
No. 107. Black Leg of Potatoes (Revised)
No. 139. Potato Virus Diseases (Revised)
No. 302. Starters for Cheesemaking (Revised)
No. 323. Virus Yellows of Sugar Beet (Revised)
No. 392. Lettuce Aphids (Revised)
No. 449. Japanese Beetle (Revised)
No. 514. The Disinfection and Disinfestation of Poultry Houses (Revised)

FIXED EQUIPMENT OF THE FARM LEAFLETS

No. 36. Silage Stores (Revised) 1*s.* 9*d.* (by post 2*s.* 1*d.*)
No. 46. Pig Fattening Houses (New) 2*s.* (by post 2*s.* 4*d.*)

The publications listed above are obtainable from Government Bookshops (addresses on p. 416*), or through any bookseller.*

Straw and Stubble Burning

As the cereal acreage grows, so does the problem of handling and disposing of straw. It is ironic that the rise in the cereal acreage over recent years has coincided with developments in other fields which tend to limit the demand for straw. The renewed interest in making greater use of straw for feeding could provide a welcome additional outlet for this potentially useful by-product. Meanwhile cereal growers in many areas at this time of the year will be faced with the problem of clearing their land for autumn cultivations in the knowledge that there is little, if any, prospect of disposing of straw at a remunerative price.

Burning straw and stubble has been practised for many years as one way of getting over this difficulty. But there are obvious risks in this, particularly if done carelessly. The consequences can sometimes be serious. Special care is needed during hot, dry summers such as we had last year, when the number of incidents of straw and stubble fires getting out of control caused wide concern. It is impossible to eliminate every risk, but sensible precautions can be taken to try to ensure that no danger, damage, or inconvenience ensues. The safety code set out opposite, which was recently published by the National Farmers' Union in consultation with Government Departments, Local Authorities' representatives and other organizations, well deserves careful study and, what is more important, putting into practice.

The Code

1. Never burn straw or stubble when and where it is clearly imprudent to do so, particularly when the conditions are tinder dry or when the wind strength and direction is, or is likely to be, such as to create a hazard.

2. Never burn where smoke is likely to create a danger to users of the highway; you risk prosecution.

3. **Always burn into (against) the wind: never burn downwind.**

4. The least dangerous time for burning straw is early morning when there is a dew. Late afternoon burning may be undertaken if perimeter cultivation and burning have been satisfactory. *Avoid midday burning. Do not burn after dusk.*

5. Do not burn where there is a timber or thatched building, a rick or stack, any farm equipment or stock in the field or nearby. Make sure there is an adequate firebreak when there is in the same field or adjacent—

any standing white straw crop;
any woodland or game covert;
any boundary fence or hedgerow.

6. The necessary width for a firebreak depends on the strength of wind, dryness of straw or stubble and other factors. In favourable conditions a minimum firebreak for (short) *stubble* should be ten furrows (about 9 feet) ploughed in, and for *straw* three combine widths (or about 20 feet) cleared by any of the following methods:

bale and remove straw from field, thoroughly cultivate or plough; plough or cultivate to a degree sufficient to bury the straw for three swaths (or a minimum of 20 feet); cultivate around the boundary and between swaths, then burn the straw in from the perimeter, one swath at a time. This method should preferably be used only in early morning when the dew is on.

7. Clear away or bury all stubble or loose straw from near hedgerows, especially at corners.

8. Notify neighbours in advance. If you have any doubt about the precautions you are taking, *consult the fire brigade.*

9. Never leave burning unattended. Ensure that responsible hands are available for effective control and that they have fire beaters or wet sacks. Where practicable have an emergency supply of water.

10. Before leaving the field examine the area and tread out any smouldering. Return an hour later to check again.

11. If the burning looks like getting out of control, call the fire brigade immediately. Decide in advance how the address can most clearly be stated and include the name of the district or parish. See that someone present knows this address, the location of the nearest available telephone, and the correct emergency method for calling the fire brigade. Meet the fire brigade at the roadside and show them the best way to the fire.

12. Remember that strong fire creates its own wind currents by which burning straw can be carried considerable distances. **Do not let fire spread beyond your capacity to control it.**

Know your Market

Roger Folley

In a notable enquiry into the nature of the demand for flowers, sponsored by the now deceased Horticultural Marketing Council, the unique attraction of flowers to womenfolk was revealed. The housewife being in most cases the home-maker—and given the chance, only too anxious to express her feelings by buying flowers to bring living, bright colour into her home—it follows that if more flowers could be grown, their prices reduced, and a little gentle persuasion given, the buying of flowers could be much increased. Up to the present time only well-to-do households have been furnished with regularly-bought cut flowers. For the big majority of private buyers (public functions are also important) flowers are an occasional purchase—a response to a festival or celebration.

Flower procurement

Retail florists, for their part, have quite a problem in procuring the type of flowers they want in the quantity and at the time they want them. Flowers are not delivered regularly to florists' premises, like the daily milk; and a lot of effort is put into flower *procurement*. For florists within easy reach of a large wholesale market there is an obvious and reliable source of supply: but the importance of a wholesale market declines in proportion to distance from it. For florists in the country towns and in the cities without markets,

local nurseries are more frequently the source of flowers, whether for making-up or for selling as cut blooms. The apparent extremes in retail florists' requirements are the West End premises, which want only a limited range of the most expensive flowers and every bloom perfect, and the small town florist who can supply many of his needs from his own nursery.

Neither at the extremes nor in any intermediate position, however, can the florist be self-sufficient. Particularly south of the Thames, florists who pride themselves on their clientele find it advantageous to avoid markets and go straight to the grower—perhaps by mutual agreement—for *some* flowers because specific requirements of colour, freshness, or size of consignment or emergency purchase are best met in this way. On the other hand, the small-town grower-retailer may often find himself short of open blooms of roses or carnations in winter, and may choose to meet his need (given sufficient notice) by direct importation.

In fact, there is no arterial movement of flowers within Britain which puts an acceptable range of both in-season and out-of-season flowers (for both are constantly required) within florists' reach every week of the year. This fragmentation in distribution is a good copy of the fragmentation in production, and is symptomatic of the undeveloped state of horticulture in Britain. It would be too much to expect that flower marketing in its present state could sustain, or would stimulate, a widespread extension of flower buying at retail, even if prices were right. The present system contains the seeds of progress in the form of the few firms which have adopted mass production methods; but they are a long way from growing into mass distribution.

Preference for different sources

A recent nation-wide survey of retail florists' experiences by Wye College established the fact that in England and Wales as a whole the large wholesale market is the focal point in flower buying—but more so in terms of quantities of flowers than in terms of number of buyers: bearing in mind that most florists do not restrict themselves to one source, wholesale markets are only more important than flower-growers in the lives of florists as a whole by a slender margin.

Seventy florists from all parts of the country gave the following mention of their sources of supply:

Wholesale market	in 117 instances	Own supply	in 44 instances
Direct from grower	in 101 instances	Imported	in 43 instances
Secondary wholesaler	in 47 instances		

Total mention 352 instances

There were many reasons given in explanation of this pattern of procurement. Retail florists (as distinct from greengrocers who also sell flowers) predominate either in good-class districts or serve good-class households. It is not surprising, therefore, that they were preoccupied with that elusive attribute 'quality' in their purchases. It was in pursuit of quality that many florists sought out a good grower on whom they felt they could rely. Two other reasons for which direct supply was preferred to acquisition from a market were, first the service offered, and secondly a lower price. As regards convenience and the range of flowers obtainable, markets were preferred: markets were also used by a small proportion of florists because there was

The large wholesale market is the focal point in flower buying. Early morning in Covent Garden

no alternative. Association between source of flowers and relative advantage of each source can be derived from the following schedule of 'mentions'.

	Wholesale market	Secondary wholesaler	Direct from growers	Own supply	Import-ation	Total
Better quality	29	10	32	11	13	95
More convenient	29	10	23	10	9	81
Wider range	25	7	13	6	10	61
Better service	15	13	16	6	7	57
Prices lower	10	6	13	5	3	37
No alternative	9	1	4	6	1	21

Commercial failings

The quest for quality has its dark side—the number of instances in which florists had to 'make do' with flowers that in some respects were not as good as they would have liked to have. Florists serving residential districts—where, it will be remembered, flowers were most regularly bought for the home—often complained about irregularity of supplies (on the markets). Over a wider field, more than half (54 per cent) the number of florists concerned in the survey who could be categorized as remote both from market and from an area of production reported dissatisfaction with the condition of blooms at time of purchase. 'Blooms too open' was the most frequent complaint; followed by 'not best colours', 'inferior packing or grading', and 'blooms too small', in that order.

This range of requirements puts the grower in a quandary. Flowers for an 'occasion' need to be in full bloom: if bought for the home, their vase life is the most important feature and buyers prefer not to have had too much of this wasted on the market premises. It is significant that the Dutch bulb growers' association has for the last two campaigns focused its publicity in Great Britain upon the beauty and durability of flowers in bud.

An involved situation

Any aspirations of a sustained and considerable rise in the level of flower purchases have to contend with the hard facts of the real-life demand and supply situation. Flower purchases are increasing, but not at a faster rate than the purchase of most other products. Both buyers' purchasing habits and growers' production practices will acquire a new facet if there is a radical expansion in consumption.

Most recently, significant advances have been made in production techniques of flowers which are in demand throughout the year. Output of chrysanthemums has much increased, following a similar movement (and a reduction in average market price) in carnations. Roses are also in this category of a year-round flower. They are said to be relatively scarce, particularly during the winter months: it is then that florists remote from English sources of supply have to look abroad, because roses do not often find a place in the competitively selected crops on country nurseries.

By way of contrast, it is during the autumn and winter that the maid-of-all-work flower, the chrysanthemum, becomes more plentiful. Late-season chrysanthemum-growing is dispersed more widely throughout the country than carnation or rose-growing, and an enormous supply is generated on thousands of separate holdings for local delivery. Fortunately for the markets they are spared a lot of the up to eightfold increase in demand which florists can experience for the Christmas season. Chrysanthemums are already the most valuable flower in the English trade: they are now popular both as sprays and as cut blooms, and if the American lead is followed, there is a big future ahead for the potted chrysanthemum. Once they become aware of it, women will take to this crop for the pleasure of watching the plant grow as well as flower.

Flowers with a definite season, such as narcissi and tulips, are less important in the trade after the first four months of the year. During May the most regular flower buyers are known to turn to their gardens for some of their blooms, and a less demanding type of buyer steps into their place at the florists, attracted by the reduced prices.

This brief and sketchy treatment of flower supplies at the retail stage has perhaps outlined how difficult an operation it would be to act upon an interpretation of an increased demand for flowers as a desire to increase purchases of *all* flowers by a given amount. Forced bulb production, for example, occurs largely in East Anglia, and is a seasonal activity. Roses are another crop whose production is localized (in the Lea Valley) but definitely not seasonal. Chrysanthemums are, on the whole, a seasonal crop, but are not localized any more than tomato growing is. For the summer season, flower production numbers are swollen by outdoor growers, and the distribution pattern alters again. There is no constancy in the production distribution pattern of flowers, whether they are complementary or competitive lines in the shop.

For the reasons outlined and quite apart from the nature of consumers' seasonal preferences and sporadic desires, a general stimulation of all producers of flowers to grow more flowers is out of the question. The only conceivable development which will bring this about is a ramification through the trade of one type of flower which can be marketed in appealing form for, say, at least eight months of the year.

31. Monmouth

E. O. Moore

THE Monmouth district occupies the north-east corner of Monmouthshire, the boundary with Herefordshire and Gloucestershire on the east being the River Wye and its tributary the River Monnow, except for an enclave around the town of Monmouth. This part of the Wye Valley is famous for its scenery and the southern boundary of the district stops just short of the tourist centre of Tintern. To the west, the boundary skirts the River Usk close to the small town of the same name, and extends on a line skirting the villages of Raglan, Llanvapley and Llanvetherine, to just short of Grosmont.

There is much of interest to historians in this part of Monmouthshire. There are many ruins of castles dotted throughout the area—relics of the border feuds between the English and the Welsh—and controversy still arises as to whether the county is in England or in Wales. Fortunately it is now purely a verbal conflict. The best known of the border castles are those at Monmouth, Raglan, Skenfrith and White Castle; Monmouth Castle was the birthplace of Henry the Fifth, whose father, Henry the Fourth, fought a battle with Owen Glendower at Graig-y-Dorth, a hilltop a few miles from Monmouth. As well as the castle and its associations with the Lancaster kings, Monmouth was also the scene of battles between the Roundheads and the Cavaliers.

It is a truly rural district, with only a few light industries around Monmouth, the only town. Monmouth has a population of just under 6,000 and is a market town, with agriculture, forestry and the tourist trade as the main activities of its inhabitants. It is also a mecca for fishermen, the rivers Wye, Usk, Monnow and Trothy being noted for trout and salmon fishing.

The district consists of hilly, well-wooded, undulating countryside with many small farms. Rainfall averages 35 inches in the more upland areas, and between 25 and 30 inches in the area between Monmouth and Raglan. The geology is dominated by an Old Red Sandstone formation which can be divided into two groups, Upper Old Red Sandstone and Lower Old Red Sandstone. The former runs in a narrow strip down the Wye Valley south of Monmouth, and merges towards Chepstow with Carboniferous Limestone Series. The Lower Old Red Sandstone covers most of the remaining area and it consists of Brownstones and various types of Marl. In the river valleys, and towards the western boundary of the district, are to be found deposits of

Glacial Drift, while an outcrop of Silurian rock occurs towards Usk. All these soils are moderately acid and deficient in phosphate, but given adequate treatment, can be very productive.

Rainfall and climate are ideal for grassland farming and only about 15 per cent of the agricultural land is in arable crops. Forestry is an important feature, and there are approximately 6,500 acres of Forestry Commission plantations plus quite a large amount of privately-owned woodland. This is a district of mixed farming. About half the farms have dairying as the main enterprise. The more specialized dairy farms are in the lowland areas, but all parishes have some milk producers. Livestock rearing of cattle and sheep are the chief enterprises of the upland and semi-upland areas. Most farms have ewe flocks which are kept mainly for fat lamb production.

The district can be roughly divided into five areas. The first, south of Monmouth, comprises the Wye Valley and the upland Trelleck district, which rises to 1,000 feet. The steeper slopes are covered by Forestry Commission plantations, this woodland extending to 5,000 acres. At about 700 feet there is a plateau where farms are mostly engaged in dairying, though a number specialize in growing seed potatoes for the Pembrokeshire early-potato district. Between the woodlands are many smallholdings, some farmed part-time by forestry workers who mainly rear beef stores. Towards Chepstow this plateau gradually slopes to about 400 feet, where the soil is an easily-worked sandy loam facing south. There are some bigger farms here, some of them with a considerable arable acreage.

A lowland, fertile area borders the A40 road and dairying and cereals are the main activities. Near Raglan this part widens towards the villages of Penrhos and Llantilio Crossenny and the soil becomes lighter, due to glacial deposits, making it ideal for cash cropping.

South-west of Raglan is a well-wooded district of low hills known as Gwehelog, which runs down to the River Usk. Here are to be found many small, livestock-rearing holdings as well as some small dairy farms, while in the Usk Valley there are larger dairying and a few intensive arable farms.

A small area east of Gwehelog and bordering the Olway Brook is known as the Llandenny Bottoms. Here the soil is alluvial, and it is a noted area for fattening beef cattle. There are some excellent dairy farms, and good cereal crops can also be grown.

North of Monmouth and the A40 road, the land is hilly. It rises gradually to 1,387 feet on the Graig Hill, from the top of which there is a magnificent view of ten counties. The soil here is mainly medium loam with some pockets of clay loams near the River Trothy. This is an area of mixed farming, with dairying, livestock rearing of beef stores, and fat lamb production as the main enterprises. The Monnow Valley is the most fertile part, and of recent years its arable acreage has increased, some farms now practising an intensive arable system.

Except for a few specialized poultry units, factory farming has not yet arrived in the Monmouth district, but, as in most other places, the trend is towards bigger and more efficient holdings, with the replacement of traditional buildings by steel and concrete. Soon a new, fast road will be completed, linking the whole area to Birmingham. Many are apprehensive of the effect of this on the countryside.

G. D. NIGHTINGALE
Agricultural Land Service, Lewes

Reclamation of Derelict Woodland

DERELICT woodland adjoining agricultural land may be an eyesore; but it may also have a potential value that could be worth exploring. For any landowner or farmer who decides to tackle it there are a number of physical features to be considered in relation to the expected benefits and the expenditure involved.

If it lies close to the homestead, its reclamation could increase the area of pasture which the cows can reach when turned out. If the farm is 'narrow', the reclaimed area may provide a pasture as an alternative to an existing permanent pasture field through which the dairy cows pass in order to reach more distant fields. Greater scope for rejuvenation of pastures or more frequent growing of kale or cereals may result.

A new cultivable area on a farm may also permit the shape of smaller fields to be improved, or it may facilitate the removal of hedges. Furthermore, the cost of maintaining fences and ditches may be considerably reduced, and the shaded strip which adjoins woodland eliminated.

If the reclaimed land is likely to increase the area of the farming unit considerably, say by 50 per cent, it would be necessary to consider the effect on the farm's production, on the farming policy, and on the need for expenditure on fixed equipment. When these factors and any other benefits have been evaluated, it should be possible to assess the period over which the expenditure should be written off and the reasonable increase of the rental value. The assistance of the owner's valuer will be needed to advise the maximum cost which is justified.

The area should be carefully inspected when the leaf is off and preferably during a period of heavy rainfall. A casual walk through a wood can easily miss minor watercourses, springs, minor ironstone workings, etc. The number of ditches to be left open will affect the size of fields, the cost of fencing and the total acreage of drillable land. Special attention should be paid to the quality and depth of the top soil, to the amount of soil which will have to be moved or graded during clearance operations, and to the land's latent ability to grow good grass.

When inspecting a wood, the nature and density of the undergrowth, the date that the timber was cut, and the age, size and number of treestools must be recorded in detail on a plan. If the area is not uniform, it should be divided on the plan into suitable blocks giving this information. When the specification, on which tenders will be based, is drawn up, it should show for each block of woodland the different methods of clearing to be used, and the quantity and size of treestools present. It is worth remembering that a contractor, when inspecting the land, is likely to look at the worst part and to quote accordingly when submitting his tender.

When the maximum expenditure and the cost per acre of doing the work are finely balanced, that part of the woodland which will most benefit the farm should be reclaimed first as a pilot scheme. Alternatively, it can be done as a part of the whole project, but with the owner reserving the option to withdraw from the remainder. Tenders should not be invited from contractors who have had no experience in woodland clearance, i.e., in removing all growth without the dissipation of the top spit. An experienced contractor can be relied upon to decline an invitation to tender if he feels the job to be beyond his resources.

If the benefits resulting from reclamation are assessed in the autumn and the costs ascertained by the end of February, work can begin in the best season, say early May. There is then a good possibility of the woodland being converted to bare ploughable land in one continuous operation. Bonfires can keep pace with the bulldozer and dispose of all debris, including the treestools.

Bulldozers should preferably be equipped with comb-like, rather than spade-like, blades, and should work along the contours. Debris should never be piled along the edges of the reclaimed land, but should be stacked in windrows along the contours where the sun and rain will cause much of the earth attached to it to fall out. Subsequently, the remaining roots and debris should be turned by a bulldozer so as to shake out more earth. The roots and debris can then be compacted for burning whenever the weather permits.

The specification to the contractor should itemize everything which the contractor will have to do in order to leave the reclaimed land in suitable condition, i.e., the top soil must be in the right place and there must be no hazards to ordinary farm implements. It is a mistake to rely on broad conditions which merely place overall responsibilities on contractors. Doing this can result in a job running into an extra season with inevitably a material increase in cost. Digging new ditches can be undertaken by the main contractor, but it will be necessary to take into account the likely cost of any tile drainage which would seem to be required.

It will be clear that, having carefully assessed the benefits to be obtained from a reclamation scheme, it is essential to provide a good plan and a detailed specification of all work that has to be done. It is also advisable to obtain tenders rather than estimates, and to enter into a contract for payment to be made by stages rather than on an acreage or percentage basis.

A final word of warning: if the start has been delayed and seasonable weather is vital to the scheme's satisfactory completion, leave the job another year.

Government assistance became available with the introduction of the Farm Improvement Scheme.

IN BRIEF

Why not plant a hedge?

During and since the war when there was a good deal of emphasis on arable farming, many miles of hedges were removed—often with advantage. On large arable farms, many acres have been reclaimed and working conditions made easier by the removal of hedges; and where there is no risk of soil blowing this has been all to the good. But on livestock and mixed farms, where a return to grass farming or alternate husbandry is taking place, there is something to be said for the replanting of hedges. A well-planted, carefully maintained hedge will last for many generations: they make an effective barrier against livestock; give shelter and shade to livestock, and shelter to crops and soil.

Hedges are usually planted on farm boundaries, against public roads as protection for exposed fields and around home paddocks. If hedges are to be used as internal divisions, care must be taken over the size and shape of fields. Whenever possible, plant hedges in straight lines and make the fields square. The making of small fields, except as home paddocks, should be avoided.

The plant most commonly used is hawthorn, also known as may, quick and whitethorn. Plants should be obtained from a good nursery and if possible from an area of poorer soil than that in which they are to be planted. The plants should have been cut back twice and should be from two to three feet high. The planting area should be well cultivated, free draining, approximately 2 feet wide, and deep enough to give good root cover for the plants. A rotavator is very suitable for this. If necessary the planting area should be ridged up to prevent waterlogging.

The plants should be set in a double row and staggered, putting eight to the yard, the rows being 6 inches apart and the plants 9 inches apart in the rows. Autumn planting is best, although it can be done at any time until early spring if the weather is open.

Damage by rabbits, hares, sheep or cattle should be guarded against by erecting protective fences on each side of the newly-planted hedge. The fences should be erected far enough away from the hedge to give room for a mechanical grass cutter to be used to keep down weeds and grass—say a yard. Mowing twice a year should keep grass and weeds under control. An application of 4 oz per yard run of a compound fertilizer in the spring is helpful. Gaps should be 'beaten up' with new plants each winter.

A good grown hedge can be stockproof within five to six years of planting, and be ready for cutting and laying in eight to nine years. If cutting and laying is properly carried out and the hedge well maintained, a good stockproof fence will result and will last for many years.

R. H. Watkins

Ewes go to the Dentist

When a ewe's incisor teeth start growing out beyond the dental pad she is beginning to get broken-mouthed. But this can now be treated by grinding her teeth down with a high speed dentists' drill, so that they once more occlude with the dental pad. This operation firms up the teeth in the gum and may add years to the useful life of the ewe.

The long-term effects of this dental treatment are the subject of trials at the Rowett Research Institute, and the N.A.A.S. High Mowthorpe Experimental Husbandry Farm is co-operating in this work. It must necessarily be some time before all the observations and records are assessed, but results so far have shown that the rate of dental deterioration appears to be higher in those ewes wintered on folded roots than in those wintered on silage.

Farm Buildings: a revised British Standard

Up-to-date requirements for *General-purpose farm buildings of framed construction* are set out in a revised edition of B.S.2053. A number of alterations have been made to the specification, based on the views of specialist manufacturers with wide experience of this type of building and close knowledge of farmers' needs. The single-storey buildings covered by the standard are adaptable for a wide range of farm uses. In the new edition, flatter roof pitches have been introduced, and the previous limitations on dimensions of spans and bays have been deleted, giving the designer greater freedom to meet the needs of particular sites.

The standard specifies basic design requirements, suitable materials—aluminium alloy, concrete, timber or steel—together with appropriate finishing and preservative treatments.

Farm buildings of this type are usually erected by the supplier, but the necessary foundation work may be carried out by the supplier or customer. The standard therefore makes detailed recommendations for foundations and for the anchorage of supports in the foundations.

Copies of B.S. 2053 may be obtained from the B.S.I. Sales Branch, 2 Park Street, London, W.1, price 7*s.* 6*d.* each (postage will be charged extra to non-subscribers).

How much lime in a laying ration?

The level of calcium in poultry rations commonly recommended in this country for high-producing layers is about 4·2–4·5 per cent CaO. In the United States, however, higher levels up to 6 per cent CaO have been advocated. Is this higher rate worth while?

To answer this question Gleadthorpe E.H.F. fed 360 light heavy-laying cross pullets with a ration containing 5·7 per cent CaO (4·1 per cent Ca) and a similar number of pullets the same ration but containing 4·2 per cent CaO (3·0 per cent Ca). The calcium was provided as limestone flour and no grit was fed. In the first 8 weeks of the experiment, when production was rising to its peak, the levels of lime were 4·5 per cent and 3.0 per cent CaO respectively.

After 46 weeks in lay, hen-housed egg production was 224 eggs in both groups. There were no material differences between the rations as regards percentage of cracks, soft shells or rejects. So it seems that for a typical light heavy pullet at this level of production there is no justification for including more than the normally recommended amounts of calcium in the diet, i.e., around 4·5 per cent CaO.

Books

Essays on Crop Plant Evolution. Edited by Professor Sir JOSEPH HUTCHINSON. Cambridge University Press. 50*s*.

Progress in the study of the origins of our crop plants has been rapid in recent years, but our sources of information on recent advances in this field have been limited to papers published in many different scientific periodicals and to a few specialist monographs.

This book presents a summary of the present state of knowledge with the forage grasses and legumes, potatoes, wheat, barley, oats, sorghums and maize. There are interesting references to some of the early crop-plants such as Chenopodium and to characteristics of the Gramineae which have replaced them as food crops. The essays comprising the different chapters are based on lectures given recently in the University of Cambridge by recognized authorities on these crops.

The value of these essays on particular crop plants is much enhanced by Professor H. Godwin's account of the time scale of the development of arable cultivation in Western Europe, so far as this is revealed by studies of pollen grains, and other plant remains from earlier times.

The opening chapter on the evolution of modern maize describes one of the most fascinating developments in agricultural botany, much of the research work having been done by the author, P. C. Mangelsdorf. The particular opportunities which exist in wheat are discussed by G. D. H. Bell and Ralph Riley, who pose the vital question as to how far man is able to retrace certain critical steps in the evolution of this crop and to re-create forms which might be able to meet more satisfactorily the agricultural needs of the future.

In the history and relationships of cultivated potatoes, K. S. Dodds gives an interesting account of work done since the classic investigations of R. N. Salaman. There is probably no other crop in which wild species have been so effectively used in breeding for greater resistance to pests and diseases.

J. P. Cooper's account of the forage grasses and legumes brings together some of the more important work in plant introduction, breeding and plant physiology, which suggests that there should be significant improvements in grasses and clovers in the near future.

In the final survey, Professor Sir Joseph Hutchinson draws attention to important general principles which have governed the development and improvement of the world's food crops, such as the effects on evolution of the development of the self-pollinating habit in wheat and barley. It seems that the rate of crop improvement in the future is more likely to be restricted by our scientific insight and imagination than by any limitations in the biological material with which we have to work.

Within the space of less than 200 pages, this book contains an authentic account of the history of development of some of our main crop plants. Though the terminology is that of the scientist, most of the chapters are written in a clear and straightforward style; it can, therefore, be strongly recommended to students of all ages. Non-specialists will find it an excellent first reference book.

F.R.H.

Farm Pests: An Aid to their Recognition. T. E. T. TROUGHT. Blackwell Scientific Publications. 12*s*. 6*d*.

The purpose of this small book is to try to help the farmer to identify the pest insects which attack his crops. It includes 31 coloured plates, reproduced from water-colours by Doris R. Thompson. These show the damage done to crop plants, and depict all stages in the life history of the pests. Academic entomologists may criticize some of the drawings, which are artist's representations and are not always taxonomically accurate. This is, however, intentional, as they show what the farmer may be expected to see with his own untrained eyes. It is true that if there is no extensive damage to tie up with observations of insects found in the crop, wrong identifications particularly of such insects as frit flies and aphids will be possible, but the most accurate and detailed drawings would be equally likely to be misunderstood. The most disappointing plate,

No. 31, deals with beneficial insects—lacewings, hover flies, ladybirds and predatory bugs.

A page of notes goes with each plate. These give a brief description of the insect, its life history, the plants which are attacked, alternative host plants, and the symptoms produced. These notes are excellent, and a triumph of condensation and clarity. Most farmers will find them illuminating.

Agricultural advisers and entomologists do not need a book like this for their own use, but could find it very useful for putting over information. If a farmer can be shown, in print, in an easily understood form, the same information which is being given by word of mouth, he is more likely to accept it and take the proper action. It only remains for us to be sure what that 'proper' action may be! Also scientists, with no agricultural training, will find this a useful introduction if they are about to tackle field problems.

Although this book is sponsored by the Shell Chemical Company, and in the foreword by the Manager of the Agricultural Technical Department, the hope is expressed that it will be 'a useful aid to the farmer in protecting his crops against pest damage', there is no reference to sprays or insecticides. The only mention of control is the short section on beneficial insects. This broadminded attitude of the Shell Chemical Company will be generally appreciated; basic information like this will not get rapidly out of date.

K.M.

Fertilizer Application—Soil, Plant, Animal. ANDRÉ VOISIN. Crosby Lockwood. 18*s*.

André Voisin begins his book with the statement, 'If not *the* most important, mineral fertilizers are one of the most important of the discoveries of modern chemistry. Well applied, they maintain and even raise soil fertility, increase crop yields and improve the feeding value of agricultural produce'.

It is in full recognition of the value of fertilizers, that he devotes the rest of this short work to an examination of the principles governing the need for fertilizer use and the dangers inherent in the neglect of these principles, or laws, and the consequent abuse of fertilizers.

Dr. Voisin's 'laws' have a deceptive simplicity. They are, in principle, incontrovertible and yet, in practice, they do not specify when too little or too much of any fertilizer is being used. It follows, therefore, that this is not a farmer's guide to current fertilizer practice. It is written as a philosophical guide to all concerned with fertilizer use, as a warning and an inspiration to advisers and research workers, as a brake to the over-optimistic and as a spur to the cautious.

The book, a reprint of some lectures delivered to Laval University, Canada, discusses the desirability of maintaining 'an optimum balance among the soil elements' in order to achieve high yields and good biological quality. This latter quality is considered to be of paramount importance in selecting the criteria by which optimum fertilizer use and optimum balance between elements is judged. The author states that biological value and yield are dissociated and that to maintain a high biological value and the consequent sound metabolism in the animal consuming the crop, yield of the crop may have to be below its maximum. Finally, he pleads for the integration of agricultural, veterinary and medical science in order that a sound code of preventive veterinary and medical science can be developed.

The shortcomings of the book are perhaps unimportant to those familiar with the subject. But to the uninitiated the absence of any mention of metabolic disorders arising from the excess of minor elements, in particular copper and molybdenum, and the general assumption that it can always be right to apply these minor elements, is a serious fault. Little indication is given that there are, as yet, no definitive standards by which we can judge either the correct rate of application of trace elements in those cases where they are manifestly required, or the correct plant content of trace elements where the need for their application is in doubt.

Nevertheless, in covering ground rarely touched upon by informed scientists, Dr. Voisin performs a service in stressing that one cannot assume that all fertilizer applications are beneficial. One must also applaud his concluding plea for the integration of the appropriate sciences concerned with food production and health. In the end, the products of agricultural science are consumed by the subjects of medical science, and a divorce in the aims of the two sciences must lead to disaster.

P.G.S.

Lincolnshire—A Shell Guide. JACK YATES and HENRY THOROLD. Faber and Faber. 15*s*.

Many people look upon Lincolnshire as a county that has not a great deal to offer the tourist, except for a few places like Lincoln and Stamford. Some of its main roads, and particularly the A17, which threads its often tortuous way through the Fens, certainly have long, dull stretches broken only by beautiful churches and occasional pleasant pieces of Georgian domestic architecture.

The latest addition to the series of Shell Guides should lead to a much wider and better appreciation of this second largest of English counties. It describes an area with a great diversity of interest and attraction, not least some splendid mansions, and a wealth of historical associations. Lincolnshire's relative geographical isolation has given it a character of its own, making it, as the authors put it, '. . . another country, almost, whose associations are with the sea and with Denmark and Holland rather than with England and the English Midlands'. About one-third of all the village names in the county have Danish endings.

The landscape falls into two broad divisions—the Wold country, where Tennyson was born, and the flat expanses of marshland and fen, 'with two-thirds of every eyeful sky'. Messrs. Yates and Thorold are careful to indicate the clear distinction between the two kinds of level—the marsh along the coast between the Wash and the Humber, with its brackish dykes and productive pastures, and the silt fenlands to the south encompassing some of the richest arable land in the world. There are also stretches—many of them off the beaten track—of another kind of terrain, as exemplified by the sandy heaths and pinewoods around Woodhall Spa, where towards the end of last century an abortive search for coal led to the discovery of medicinal springs.

It is in the Fens that Lincolnshire's finest and best adorned churches are to be found, a fact that has always puzzled archaeologists since, as the authors point out, there is no building stone in this area. 'No satisfactory reason for these grand—and for the population much oversized—churches has ever been found other than the commercial prosperity of Boston and the pride of the monasteries at Crowland and Spalding.'

For domestic urban architecture, pride of place is given to Stamford and Louth—which are rated among the most distinguished old towns in England—while in the county's great houses, Grimsthorpe (the earliest part of which is 13th century), Brocklesby (circa 1730) and Belton (17th century) are singled out for special mention as 'the grandest seats'.

The greater part of the book is in gazetteer form (with map references) and the notes are concise and objective. Mablethorpe, for instance, is introduced as 'a kind of shack town', though with unsurpassed sands; while of the Roman-walled Caistor we are told: 'there never seems to be much shopping going on and the Market Square has a depressed aspect'.

Crammed as it is with other kinds of information, the guide does not touch to any extent on Lincolnshire's farming. More than three pages of text and pictures are devoted to Boston (which at the end of the 16th century was second only to London in trade), but I looked in vain for a reference to its role as a great centre of the potato growing industry and for confirmation of a story once told to me by a Lincolnshire man that something over sixty years ago seed potatoes of a new variety, over-optimistically called Eldorado, changed hands in the market there at 25*s*. apiece.

Running to 160 pages and with over 120 splendidly reproduced and well-chosen pictures, this is a distinctly superior guide book remarkably cheap at 15*s*. and well worth a place in any library.

A.L.M.

Fertilizers and Profitable Farming (Second edition). G. W. COOKE. Crosby Lockwood. 18*s*.

That a second edition of this excellent guide to fertilizer practice should appear so soon after the original 1959 edition is not surprising. The trend towards more concentrated materials, available as high-analysis compounds or based on single substances that provide comparatively high percentages of N, NP and KN (ammonium nitrate, urea, ammonium phosphate and potassium nitrate) has made much of the first edition's detailed advice out of date. Also research results published during the past five years have brought new understanding to the problems of how to use these, and the more familiar older fertilizers, to best advantage.

Hence, in addition to general revision, the chapter on fertilizer recommendations for grassland has been rewritten and there are new sections on liquid fertilizers and on liquid manure. In his preface, Dr.

Cooke states bluntly that farming is becoming increasingly dependent on scientific work . . . in many branches, traditional skills and knowledge are less important than recent technical advances and the ability to use labour more skilfully. British farmers now spend about £120 million a year on fertilizers and manures—nearly 10 per cent of total farm expenses—so clearly there is no need to stress the importance of getting the best possible return from this outlay.

As head of the chemistry department at Rothamsted Experimental Station for many years, and now one of the Station's two deputy directors, Dr. Cooke writes authoritatively. As those who have heard him lecture will confirm, he has a thoroughly down-to-earth appreciation of practical farming, as well as the rare gift of making research results understandable to everyone. His book explains, with admirable clarity, what kinds of fertilizers are available; how to work out prices, analyses and unit costs; how to choose the right amount of the right type for each individual farm crop; and it gives sound advice on when and how to apply the optimum dressing.

A 'best buy' if ever there was one.

S.L.

Experimental Farm Buildings Scheme, Report No. 3—Slatted Floors. AGRICULTURAL RESEARCH COUNCIL. H.M. Stationery Office. 2*s.* 6*d.* (by post 2*s.* 10*d.*)

It seems almost unbelievable that only seven years have passed since slatted floors for farm animals were reintroduced into Britain with all the fanfares the enthusiastic innovators could muster. Now that the emotional fervour has abated, slatted floors are rightly seen as a useful development in the proper place and for the right purpose.

The climate is, therefore, more favourable for the publication of this report than would have been the case had it appeared earlier, though some may regard it as something of an anti-climax. This would be unfair. The Agricultural Research Council's grant scheme for experimental farm buildings did not come into being until the middle of 1960, when the topic of slatted floors was on the boil, so there can be no criticism about not starting sooner. In addition, a responsible body like the A.R.C. cannot rush in and publish reports based on subjective judgments and claims unsupported by unbiased records. As it is the report gives cold facts and figures coupled with critical observations, and is the best account so far of this once-burning subject.

Slat design, methods of support, and costs are fully detailed and a table of costs for buildings shows a very wide range, much of which was accounted for by the depth of the cellar beneath the slats. There is information on the making and feeding of silage on slats, with a useful table of costings.

Cleanliness of cows kept on slats seems to have been of a low order, as might be expected, but injuries were not so numerous as was predicted, especially to teats. Labour requirements showed the anticipated savings and dung removal the expected problems, which were overcome in different ways.

The report is altogether excellent; a model of clarity and brevity.

C.R.

A Library Guide to Agriculture. K. W. NEAL.

Mr. Neal has compiled a useful booklet for students of diploma and certificate levels, giving a comprehensive picture of how their libraries can help them before and after they have qualified.

His notes on using a library are detailed enough to guide students on their first visit to an unfamiliar organization, should the librarian not be free to show them around.

Full particulars are given of the various types of publication in the field of agriculture and the guides to the literature and bibliographies are listed, with brief details.

Several important agricultural libraries are described and the way in which any student may borrow books and the like from these libraries through his own library is emphasized. This guide is a simple introduction to what is becoming an extremely large subject, the literature of agriculture.

Copies of the booklet may be obtained from the author at 41 Wychbury Road, Finchfield, Wolverhampton, Staffordshire. Price 3*s.* (including postage).

P.H.

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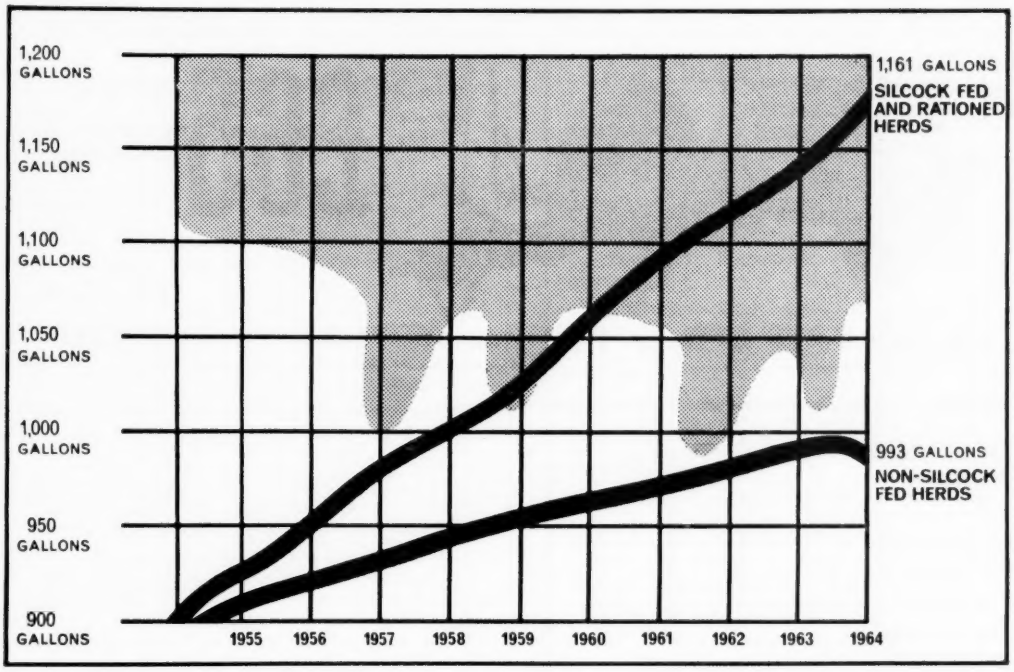

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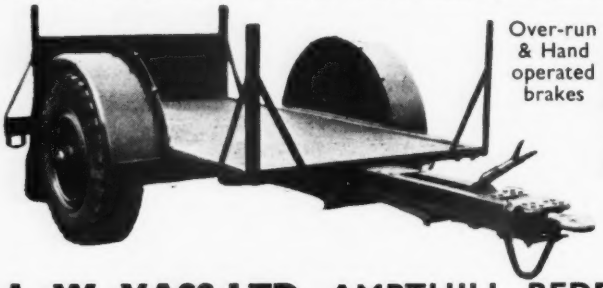

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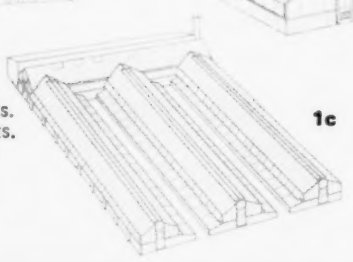

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